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Cutting Propagation of Oleander (*Nerium Oleander* L.) Using Application of Salicylic Acid

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Abstract

Oleander (*Nerium oleander* L.) is cultivated recently as a flowering pot plant and therefore abundant propagation plant material for commercial use is of great importance. Oleander is a vegetatively propagated ornamental plant valued for its evergreen foliage and showy terminal flower clusters that are available in different colours. Studies have shown that rooting, plant growth regulators is one of the effective factors at rooting of hard rhizogenetic plant such as oleander. The purpose of this study is to determine an appropriate concentration of salicylic acid (SA) on rooting of oleander. Present study showed that there was a great variation in most of the measured characters at $P<0.05$ percent level. The obtained results show that SA treatments have caused the increase of percent of rooting. The use of SA caused a positive effect on rooting. This study shows that plant growth regulators SA have a profound influence on rooting of oleander.

Keywords: Cuttings, Oleander, Rooting, Salicylic acid

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1. Introduction

Oleander grows well in warm subtropical regions, where it is extensively used as an ornamental plant in landscapes, parks, and along roadsides. It is drought tolerant and will tolerate occasional light frost down to -10 ^{o}C, 14 ^{o}F. It is commonly used as a decorative freeway median in California and other mild-winter states in the Continental United States because deer will not eat it due to its high toxicity, it is tolerant of a variety of poor soils, and drought tolerant. It can also be grown in cooler climates in greenhouses and conservatories, or as indoor plants that can be kept outside in the summer. *Oleander* flowers are showy and fragrant and are grown for these reasons. Over 400 cultivars have been named, with several additional flower colours not found in wild plants having been selected, including red, purple, pink and orange; white and a variety of pinks are the most common. Many cultivars also have double flowers. Young plants grow best in spaces where they do not have to compete with other plants for nutrients (Isabel Santos et al., 1994).

There are compounds (growth retardants/inhibitors, polyamines, phenolics) that modify main hormone effects on rooting (Hartmann et al., 2002). Salicylates, which are involved in phenolic compounds, have been considered as phytohormones (Raskin, 1992). In some woody and herbaceous plant species, salicylic acid (SA) highly promoted the *In vivo* rooting of cuttings when applied particularly with auxin (Bojarczuk and Jankiewicz, 1975; Kling and Meyer, 1983). SA inhibited IAA-induced rooting of apple stem slices *in vitro* by enhancing oxidation of IAA during the auxin sensitive phase (24-96 h) (De Klerk et al., 1997). The use of SA caused a positive effect on rooting of *henna*, the *maximum number* leaf was obtained in 2000 ml L^{-1} NAA + 200 ml L^{-1} salicylic acid (Salehi Sardoei et al., 2013). The main objective of the present work was to study the effects of salicylic acid on the rooting of oleander plants.

2. Materials and methods

2.1. Plant material and cultivation conditions

Factorial methods in completely randomized design test with eight treatments were used for this experiment. Four replication were carried out for this study (n=4). Ten semi-hard cuttings of oleander were used for each replication. In the first week of march 2012, the cuttings were collected from current year branches of the same plants. After remove the lower leaves of cuttings and stab in under of cuttings, samples uniformly were cultured in treatments.

2.2. Treatments

Cultivars white and red, cuttings initially were immersed in 3% benomyl solution for 30 minutes in order to treat and then immediately placed in growth regulators of salicylic acid (0, 100, 200, 300 and 400 mg L^{-1}) for 24 hours and NAA for 5 second, after short time, finally planted into sand (Hartmann et al., 2002; Salehi Sardoei et al., 2014).

2.3. Plant-Growth parameters

Three months after rooting, some traits are determined that they were including rooting percentage, stem length, No. of root, leaf and stem, average root length, largest root length and root length.

2.4. Data analysis

Analysis was performed on data using SPSS ver 16. Comparisons were made using one-way analysis of variance (ANOVA) and Duncan's multiple range tests. Differences were considered to be significant at $P<0.05$.

3. Results and discussion

ANOVA results indicated that effects of various SA on rooting percentage, shoot number, leaf number, stem length, average root length and shoot fresh weight was significant (not reported in the paper). Several studies showed that SA synergistically acted with IAA and promoted the root formation in mung bean cuttings. But it was non effect on Acer cuttings (Kling and Meyer, 1983). SA combined with NAA synergistically promoted the root number and root lengths of the cuttings of several *Populus spp*. Although this effect had seemed to be in relation with the clonal differences and cutting time rather than concentration and treatment methods (Bojarczuk and Jankiewicz, 1975). Mean comparison also suggests significant increase in rooting percentage compared to control treatments, the highest rooting percentage was observed in concentration of 300 mg L^{-1} for white flower, while 200 mg L^{-1} had the best result in red flowers. Application of SA was promoted the rooting of Populus cuttings depending on varieties and concentrations (Bojarczuk and Jankiewicz, 1975). However, it was ineffective in rooting of Tillia clones (Smith, 1977). Mean comparison test showed that by increased in SA, rooting percentage was also enhanced with the best results were observed in red flower. In general, the results indicate favorable influence of SA at concentrations of 200 and 300 mg L^{-1} compared to control treatment. Results show that application of SA at mentioned levels has caused the significant increase of rooting percent (Blythe et al., 2004). The cause of positive effect of these materials on rooting can be attributed to the effect of auxines at provocation of division of the initial starter cells of root (Berthon et al., 1993). The highest stem length as 15.31 cm was achieved at 200 mg L^{-1} SA for white flower and as 11.09 cm at 400 mg L^{-1} SA for red flower. The highest number of shoot in white flower was obtained in 200 mg L^{-1} (7.54 in average) and in red flower was obtained by 400 mg L^{-1} (5.25 in average) suggesting that white flower had better yield than red flower in terms of stem length and shoot length. The promotive effects of chlorogenic and ferulic acid on the formation of root meristemoids during the initiative phase coincides demonstrated by Smith and Thorpe (1977). SA found to be inhibitory on *in vitro* rooting of stem discs of apple when applied before auxin (Van Der Krieken et al., 1997). This effect was attributed to enhanced oxidation of IAA during the auxin sensitive phase by SA (De Klerk et al., 1997). Adventitious root formation comprises three successive interdependent physiological phases (induction, initiation and expression) (Gaspar et al., 1992). It suggested that phenolic compounds which are known to inhibit root formation might actually enhance root formation if applied during the appropriate phase of rhizogenesis (Berthon et al., 1993). Thus, applications of SA after IBA might be more effective on the auxin to induce root formation than simultaneous treatments of both substances. However, it is very difficult to estimate the proper application time of SA *In vivo* cuttings due to the lack of uniformity or stability in propagation material. Therefore, initial applications of SA to cuttings may also give useful results. Antonopoulou et al. (2005) reported that the effect of vitamin riboflavin (B_2) on *in vitro* of the almond x peach hybrid clone GF 667 did not stimulate adventitious rooting of the explants and rooting was very low in comparison with the control treatment. Our results were determined difficult of rooting of oleander plant. However, in this study, in ASA with IAA application groups were observed high callus formation and rarely root formation (Antonopoulou et al., 2005).

In addition to auxins, phenolic compounds either alone or in combination of auxins [17, 42] have also stimulated adventitious root formation in cuttings of several species. Singh (1993) found that SA stimulated root formation in young shoots of ornamental plants and Li and Li (1995) SA had synergistically acted with IAA and promoted the root formation in mung bean cuttings, but had no effect on *Acer* cuttings (Kling and Meyer, 1983). SA combined with NAA synergistically promoted the root number and root lengths of the cuttings of several *Populus* spp. Combined application of IBA with various concentration of SA significantly promoted the rooting of cuttings with respect to untreated ones. Eported the formation of adventitious roots on hypocotyl cuttings of mung beans (Li and Li, 1995).

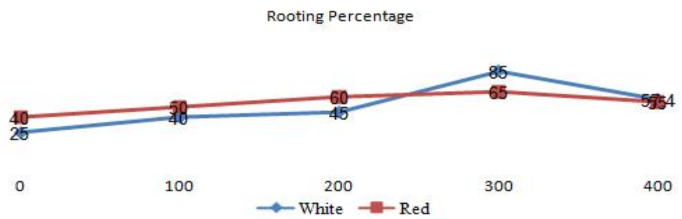

Fig. 1. Effect of various concentrations of salicylic acid on rooting of oleander plant. Cultivars white and red, Salicylic Acid, 0, 100, 200 and 400 mg L^{-1}.

References

Antonopoulou, C., Dimassi, K., Therios, I., Chatzissavvidis, C., Tsirakoglou, V., 2005. Inhibitory effect of riboflavin (Vitamin B2) on the *in vitro* rooting and nutrient concentration of explants of peach rootstock GF 677 (Prunus amygdalus x P. persica). Sci. Horticult., 106, 268-272.

Berthon, J.Y., Battraw, M.J., Gaspar, T., Boyer, N., 1993. Early test using phenolic compounds and peroxidase activity to improve *in vitro* rooting of Sequoiadendron giganteum (*Lindl*.) Buchholz. Sooci. Botany., 24, 7-13.

Blythe, E.K., Sibley, J.L., Ruter, J.M., Tilt, K.M., 2004. Cutting propagation of foliage crops using a foliar application of auxin. Sci. Hort., 103, 31-37.

Bojarczuk, T., Jankiewicz, L.S., 1975. Influence of phenolic substances on rooting of softwood cuttings of *Populus alba* L., and *P. canescens* Sm. Act. Agrobotany., 28, 121-129.

De Klerk, G.J., Marinova, S., Rouf, S., Ter-Brugge, J., 1997. Salicylic acid affects rooting of apple microcuttings by enhancement of oxidation of auxin. Act. Horticult., 447, 247-248.

Gaspar, T.H., Kevers, C., Hausman, J.F., Berthon, J.Y., Ripetti, V., 1992. Practical uses of peroxidase activity as a predictive marker of rooting performance of micropropagated shoots. Agron., 12, 757-765.

Hartmann, H.T., Kester, D.E., Davies, F.T., Geneve, R.L., 2002. Plant propagation, principles and practices. 7 nd edn. Prentice Hall, New Jersey, 880pp.

Isabel, S., Guimaraes, I., Roberto, S., 1994. Somatic embryogenesis and plant regeneration of *Nerium oleander*. Plant Cell Tissue Organ Cult., 37, 83-86.

Kling, G.J., Meyer, M.M., 1983. Effect of phenolic compounds and indole acetic acid and adventitious root initiation in Phaseouls aureus, Acer saccharinum and Acer griseum. Horticult. Sci., 18, 352-354.

Kling, G.J., Meyer, M.M., 1983. Effects of phenolic compounds and indolacetic acid on adventitious root initiation in cuttings of *Phaseolus aureus*, *Acer saccharinum* and *Acer griseum*. Hort. Sci., 18(3), 352-354.

Li, L., Li, L., 1995. Effects of recorcinol and salicylic acid on the formation of adventitious roots on hypocotyl cutting of Vigna radiata. J. Topic. Subtrop. Botany., 3, 67-71.

Raskin, I., 1992. Salicylate, a new plant hormone. Plant Physiol., 99, 799-803.

Salehi Sardoei, A., Sarhadi, H., Rahbarian, P., Rohany Yazdi, M., Arbabi, M., Jahantigh, M., 2013. Effect of plant growth regulators on rooting of Henna (*Lawsonia inermis* L.). Int. J. Adv. Biol. Biomed. Res., 1(11), 1466-1470.

Salehi Sardoei, A., Shahmoradzadeh Fahraji, S., Ghasemi, H., 2014. Effect of salicylic acid on rooting of *Poinsettia* (*Euphorbia pulcherrima*). Int. J. Adv. Biol. Biomed. Res., 2(6), 1883-1886.

Singh, S.P., 1993. Effect of non-auxinic chemicals on root formation in some ornamental plant cuttings. Adv. Horticult. Sci., 3, 207-210.

Smith, D.R., Thorpe, T.A., 1977. Root initiation in cuttings of Pinus radiata seedlings: Effects of aromatic amino acids and simple phenylpropanoids. Bot. Gaz., 138(4), 434-437.

Van Der-Krieken, W.M., Kodde, J., Visser, M.H.M., Tsardakas, D., Blakmeer, A., De Groot, K., Leegstra, L., 1997. Increased induction of adventitious rooting by slow release auxins and elicitors. In: Biology of root formation and development, 2nd edition. Edited by Altman, Y., Waisel, Y., Plenum Press, New York, 95-104pp.

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