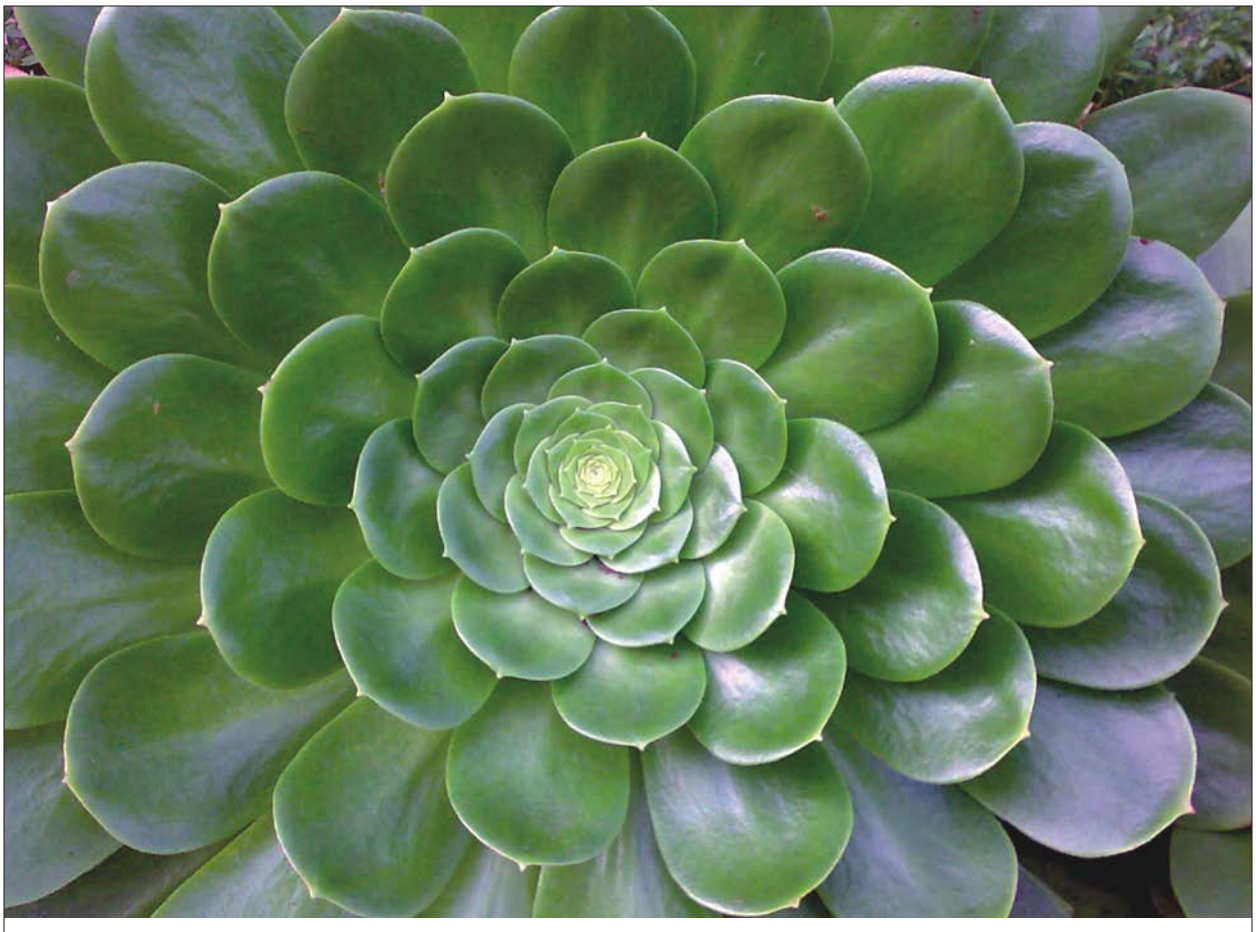

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Effect of Salicylic Acid Synergists on Rooting Softwood Cuttings of Poinsettia (*Euphorbia pulcherrima*)

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ABSTRACT

The poinsettia's species name pulcherrima means "most beautiful" and that it is. Poinsettia's brilliant red floral display held against rich green foliage has made this unlikely species a holiday favorite. Its appealing presentation of the traditional Christmas colors has so endeared poinsettia that it is now second only to the Christmas tree as the most popular holiday plant. Studies have shown that rooting substrate is one of the effective factors at rooting of hard rhizogenetic plant such as poinsettia. The purpose of this study is to determine an appropriate concentration of Salicylic Acid (SA) on rooting of poinsettia. Present study showed that there was a great variation in most of the measured characters at $p<0.05$ percent level. The obtained results showed that salicylic acid treatments have caused the increase of percent of rooting. The use of salicylic acid caused a positive effect on rooting. The callus percentage was obtained in control and 400 treatments. This study shows that plant growth regulator salicylic acid have a profound influence on rooting of poinsettia.

Key words: Cuttings, poinsettia, rooting, salicylic acid

INTRODUCTION

Euphorbia pulcherrima Wild. (Family-Euphorbiaceae) is one of the most popular houseplants seen during the Christmas time. It has brilliant colored bracts ranging from scarlet, crimson, yellow to red and white. The ability of these spectacular bracts to remain fresh and intact for three-four months adds to its demand as an ornamental. Though *Euphorbia pulcherrima* is native of Central America, this fast growing plant is one of the most common growing shrubs throughout the world. The latex of *Euphorbia pulcherrima* has been reported to be poisonous to livestock (Anonymous, 1978). However, in veterinary medicine it is used to kill maggots in the wounds of livestock (Anonymous, 1978).

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). The SA inhibited IAA-induced rooting of apple stem slices *in vitro* by enhancing oxidation of IAA during the auxin sensitive phase (24-96 h) (Klerk *et al*., 1997). The use of salicylic acid caused a positive effect on rooting of henna, the maximum leaf was obtained in 2000 mL L^{-1} naphthalene acetic acid +200 mL L^{-1} salicylic acid (Sardoei *et al*., 2013).

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 salicylic acid 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.

The main objective of the present study was to study the effects of salicylic acid on the rooting of *Euphorbia pulcherrima* plants.

MATERIALS AND METHODS

Plant material and cultivation conditions: The Completely Randomized Design (CRD) was used in this experiment. Four replicates were carried out for this study (n = 4). Ten semi-hard cuttings of poinsettia were used for each replication. In 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.

Treatments: The cuttings initially were immersed in 3% benomyl solution for 30 min in order to treat and then immediately placed in growth regulators of salicylic acid (0, 100, 200, 300 and 400 mL L^{-1}) for 24 h after short time. Finally, planted into sand (Hartmann *et al*., 2002).

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, Mean root length and callus percentage.

Data analysis: Analysis were 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 $p<0.05$.

RESULTS AND DISCUSSION

Statistical results showed that the hormonal treatments increased rooting percentages. Also the maximum percent of rooting was related to 300 and 200 mg L^{-1} treatments, respectively. Application of salicylic acid 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 (Morsink and Smith, 1975) (Table 1).

Table 1: Effect of concentration of salicylic acid on rooting cuttings of semi-rigid Poinsettia (*Euphorbia pulcherrima*)

Treatments (mg L^{-1})	Rooting percentage (%)	Stem length (cm)	No. of root	No. of leaf	No. of stem	Largest root length (cm)	Mean root length (cm)	Callus percentage (%)
Control	35^{b}	3.69^{a}	9.81^{a}	6.57^{a}	2.13^{a}	28.10^{a}	15.10^{a}	32.5^{a}
100	45^{b}	4.46^{a}	11.6^{a}	5.43^{a}	2.49^{a}	16.40^{b}	9.98^{ab}	27.5^{a}
200	50^{a}	4.26^{a}	5.54^{a}	5.35^{a}	2.66^{a}	9.62^{b}	5.39^{b}	25.0^{ab}
300	75^{a}	2.66^{a}	11.4^{a}	5.68^{a}	2.25^{a}	7.50^{b}	5.20^{b}	12.5^{b}
400	35^{b}	4.75^{a}	13.3^{a}	4.99^{a}	2.66^{a}	14.00^{b}	11.20^{ab}	32.5^{a}

*Means separated by Duncan multiple ranges test at the $p<0.05$ level

The maximum No. of root, leaf and stem for 400, control, 200 and 400 mg L^{-1} treatments respectively. Several studies showed that salicylic acid 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). Salicylic acid 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). Maximum stem length created in 400, 100 and 200 mg L^{-1} treatments.

The use of SA caused a positive effect on rooting. This result previously reported in clones of different *Populus* spp. (Bojarczuk and Jankiewicz, 1975). Callus percentage obtained in control and 400 mg L^{-1} treatments. The significant point is that the use of salicylic acid in control treatments was from positive effect on the largest root length and mean root 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). The 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 salicylic acid (Van der Krieken *et al*., 1997).

Salicylic acid showed significant effect on rooting percentage, largest root length and mean root length and callus percentage traits. Results show that application of salicylic acid 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).

CONCLUSION

The use of salicylic acid caused a positive effect on rooting. Salicylic acid treatment showed the highest content of rooting. This study shows the importance of this compound for root formation. Also, applications of salicylic acid increased rooting percentages. Our future investigations will be focused on estimating the proper application time of salicylic acid on the rooting process.

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