

## Original Research Article

# Effect of exogenous application of auxin on leaf cuttings of Mexican Snow Ball (*Echeveria elegans* Rose)

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### ABSTRACT

**Aims:** Succulents are on the rising trend of popularity due to its compromising behaviour with watering and durability indoors, creating a peaceful and healthy living condition. Thus it is the need of the hour to find a suitable propagation method or use of exogenous substances with propagation to assist regenerating new plants.

**Study design:** The experiment was laid out in randomized block design (RBD) with three replications.

**Place and Duration of Study:** The present investigation entitled Effect of IAA and IBA Application on leaf cuttings of Mexican Snow Ball (*Echeveria elegans*). Was conducted in Research Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during February, 2021 to April, 2021.

**Methodology:** The treatment in each replication was randomly allotted. There are nine treatments having one variety were used in this experimental design.

**Results:** The results revealed that among all the treatments, application of IAA + IBA (100 ppm + 500 ppm) took minimum days to rooting (9.00) and had highest number of leaves (16.56), number of shoots (2.56), shoot height (15.56 mm), shoot diameter (16.44 mm) and root length (29.00 mm).

**Conclusion:** According to the present investigation it is concluded that treatment IAA + IBA (100ppm + 500 ppm) was found most effective in terms of growth of *Echeveria* (*Echeveria elegans*).

*Keywords:* IAA, IBA, mexican snow ball, propagation, growth

### 1. INTRODUCTION

Succulents are plants that survive in arid climates with mucilaginous substances that retain water. The word "succulent" comes from the latin word *sucus* meaning juice, or sap. *Echeveria* is the largest genus of flowering plants of the family Crassulaceae and are native to remote

mountainous terrain between 1,000 and 4,000 feet elevation. Many of the 150 recognized species have been crossed to make new cultivars, of which there are well over a thousand. Most *Echeverias* that are cabbage-like, ruffled, crinkly or bumpy are hybrids *Echeveria spp.* stem from thick-leaved rosettes. They are the most beloved of succulents, and are described as everlasting flowers, for their colorful rosettes that resembles the tightly cupped petals of rose (Kapitany, 2007). Mexican snow ball (*Echeveria elegans*) is a bluish-green succulent that takes on a pink hue in the corners when exposed to bright sunlight. They form a compact rosette pattern and fleshy spoon shaped leaves. The leaves are usually 6 cm long and 2 cm wide. It offsets freely and forms a dense carpet of rosettes over time. From late winter to midsummer it sends up slender pinkish stems up to 1 foot tall which bears pinkish red flowers tipped with yellow. The specific epithet “elegans” refers to its elegant appearance. The plants are also popular as it can be propagated from leaves (Raju and Mann, 1970). The use of plant growth regulators to increase the efficacy of propagation in cutting and layering are now common and moreover, use of growth regulators has opened a new vista for nursery men for propagation of ornamental plants trees (Baghel *et al.*, 2016). The treatment of cuttings with auxins (NAA or IBA) has been reported to improve rooting in many woody species including *Bougainvillea alba* (Singh *et al.*, 2017). The present studies were, therefore, undertaken to standardize the growth regulator (IBA and IAA concentration) treatment for survival and improving the rooting of leaf cuttings in Mexican snow ball.

## 2. MATERIAL AND METHODS

A field experiment was carried out at Horticulture experimental field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P.) in the month of February to April, 2021-2022 for studying the effect of auxins (IAA and IBA) application on leaf cuttings of mexican snow ball (*Echeveria elegans*). The treatments consisted were T<sub>1</sub> (Control), T<sub>2</sub> (IAA- 100 ppm), T<sub>3</sub> (IAA- 300 ppm), T<sub>4</sub> (IAA- 500 ppm), T<sub>5</sub> (IBA-100 ppm), T<sub>6</sub> (IBA-300 ppm), T<sub>7</sub> (IBA-500 ppm), T<sub>8</sub> (IAA+ IBA- 100 ppm + 500 ppm), T<sub>9</sub> (IAA+ IBA- 500 ppm + 100 ppm). The experiment was laid out in randomized block design (RBD) with three replications. The treatment in each replication was allotted randomly. Nine treatments having one variety were tried in the experimental design. The experiment was carried out by initially by leaf propagation from mother plants of *Echeveria*. Mother plants were provided by the Department of Horticulture, SHUATS, Prayagraj. A total of 25 mother plants were utilized to pluck mature leaves (pups) and 200 leaves were plucked and kept for propagating in a well-drained potting media. Potting mixture were prepared by using combination of cocopeat, vermicompost and perlite (2:1:1) for each treatment considering the size of pot 12 cm x 12 cm. For the preparation of IBA and IAA solutions standard amount of growth regulators was

weighted. These amounts of growth regulators, then dissolved in small amount of alcohol containing few drops of ammonium hydroxide and finally diluted with distilled water. The final volume of each solution was maintained 250 ml. Quick dip method was adopted for treatment of the cuttings with IBA and IAA solutions. The basal portions of cuttings up to 2.5 to 3.0 cm were soaked with solution for 2 minutes. Pups were propagated two months before in individual paper cups and afterwards transplanted into terracotta pots on 6<sup>th</sup> February 2021. The plants were placed carefully and given slight irrigation immediately. The pots were kept under 25 per cent green shade net. Standard cultural practices recommended for *Echiveria* was followed uniformly for all the experimental plots. The data obtained were analyzed statistically as per method described by Gomez and Gomez (1984) and were tested at 5% level of significance ( $p=0.05$ ).

### 3. RESULTS AND DISCUSSION

The data presented in Table 1 reveals that in general, different rooting hormone treatments produced significant effect on rooting at various stages. Minimum number of days (9.00) taken to rooting was recorded in the treatment T<sub>8</sub> i.e. IAA + IBA (100 ppm + 500 ppm) and maximum days (19.22) was found in treatment T<sub>1</sub>(control). The results indicate the positive effect of auxins in *Echiveria* root initiation. Auxins are known to increase the cell division by increasing the level of endogenous cytokinins resulting in induction of more number of root primordia, exogenous application of auxins hastened the process of root initiation, similar findings also reported by Nanda and Kochhar (1985). Maximum concentration of IBA may have caused mobilization and utilization of carbohydrates and nitrogen fraction with the presence of co-factor at wound site which may have helped in better root initiation (Baghel *et al.*, 2015).

Experiment results revealed that at 30<sup>th</sup> days after treatment, maximum number of leaves (5.67) was recorded in T<sub>8</sub> i.e. IAA + IBA (100ppm + 500 ppm) and exhibited significant increase in number of leaves over all other treatments followed by T<sub>9</sub> which in turn were significant over the remaining treatments. Minimum number of leaves (3.11) was found to be in T<sub>1</sub> (control). At 60<sup>th</sup> days after treatment, maximum number of leaves (13.89) was recorded in the treatment T<sub>8</sub> followed (13.11) by T<sub>9</sub> which were significantly superior over remaining treatments. Minimum number of leaves (6.78) was recorded in T<sub>1</sub> (control) which had intermediate response. At 90<sup>th</sup> days after treatment, maximum number of leaves (16.56) was recorded in T<sub>8</sub> which was at par with T<sub>9</sub> (16.11). Minimum numbers of leaves (9.56) was found in control. This might be due to early initiation of roots, more number of roots and higher root length which absorbs more nutrient and water resulted in higher number of leaves after planting (Baghel *et al.*, 2015).

In general, different rooting hormone treatments produced significant effect on number of shoot at various stages. At 30<sup>th</sup> days after treatment, maximum number of shoot was recorded in T<sub>8</sub> (1.11) and minimum number of shoot was found to be in T<sub>1</sub> (0.22). At 60<sup>th</sup> days after treatment, maximum number of shoot was recorded in T<sub>8</sub> (1.89) followed by T<sub>9</sub> (1.56) which were significantly superior over remaining treatments. Minimum number of shoot was recorded to be in treatment T<sub>1</sub> (0.22). At 90<sup>th</sup> days after treatment, maximum number of shoot was recorded in T<sub>8</sub> (2.56) which was significantly superior over remaining treatments. Minimum number of shoot was found to be in T<sub>1</sub> (0.44). The higher number of shoot in IBA treated cuttings might be due to higher concentration of IBA stimulated early root initiation and faster root growth, more number of roots, longest roots etc which improved the absorption of water and nutrients resulted better shoot growth (Tyagi and Patel, 2004).

Different rooting hormone treatments produced significant effect on shoot height per plant throughout the experimental period (Table 1). At 30<sup>th</sup> days after treatment, maximum shoot height was recorded in T<sub>8</sub> (7.89 mm) and minimum shoot height was found to be in T<sub>1</sub> (4.44 mm). At 60<sup>th</sup> days after treatment, maximum shoot height was recorded in T<sub>8</sub> (13.11 mm) followed by T<sub>9</sub> (13.00 mm) which was significantly superior over remaining treatments. Minimum shoot height was recorded in T<sub>1</sub> (6.33 mm). At 90<sup>th</sup> days after treatment, maximum shoot height was recorded in T<sub>8</sub> (15.56 mm) which was significantly superior over remaining treatments. Minimum shoot height was found to be in T<sub>1</sub> (7.89 mm). This might be due to the fact that external application of auxin promoted growth and enhanced sprouting of dormant buds on the cutting leading to the formation of more number of shoots per cutting. It was also observed that treatment with increased roots per cutting absorbed increased uptake of nutrients and moisture which in turn increased the production of sprout as compared to cutting in all other treatments (Sandesh *et al.*, 2018).

Different rooting hormone treatments produced significant effect on shoot diameter per plant throughout the experimental period. At 30<sup>th</sup> days after treatment, maximum shoot diameter was recorded in T<sub>8</sub> (14.78 mm) and exhibited significantly increase in shoot diameter over all other treatments followed by treatment T<sub>9</sub> (13.02 mm) which in turn was significant over the remaining treatments. Minimum shoot diameter was found to be in treatment T<sub>1</sub> (5.33 mm). At 60<sup>th</sup> days after treatment, maximum shoot diameter was recorded in T<sub>8</sub> (15.87 mm) followed by T<sub>9</sub> (13.76 mm) which was significantly superior over remaining treatments. Minimum shoot diameter was recorded in T<sub>1</sub> (5.96 mm). At 90<sup>th</sup> days after treatment, maximum shoot diameter was recorded in the treatments T<sub>8</sub> (16.44 mm) and T<sub>9</sub> (14.89 mm) which were significantly superior over remaining treatments. Minimum shoot diameters was found to be in treatment T<sub>1</sub> (6.44 mm). Application of auxin influenced cuttings in some ways such as increasing the root number, root length; trigger or

initiate the production of root-promoting chemicals such as radiocarbon in the roots and thus increasing shoot diameter. Optimal concentrations of IBA could induce the mobilization and utilization of carbohydrates, nitrogen fraction, water and mineral nutrient absorption (Shahzad *et al.*, 2019).

Maximum root length was recorded in T<sub>8</sub> (29.00 mm) and exhibited significantly increase in root length over all other treatments followed by T<sub>9</sub> (26.78 mm) which in turn were significant over the remaining treatments. Minimum root length was found in T<sub>1</sub> (14.89 mm). The characteristic property of auxins was their action in stimulating the length of cells in their relevant growth stage. It appears likely that auxins initiate synthesis of structural enzyme proteins in the formation of adventitious root thus increasing the root length through the process of acidification (Audus, 1972).

#### 4. CONCLUSION

According to the present investigation it is concluded that treatment T<sub>8</sub> i.e. IAA + IBA (100ppm + 500 ppm) was found most effective in terms of growth of Echevaria (*Echevaria elegans*).

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UNDER PEER REVIEW

Table 1. Different rooting hormone treatments produced significant effect on rooting at various stages

Treatments	No. of days to rooting	Number of leaves			Number of shoots			Shoot height (mm)			Shoot diameter (mm)			Root length (mm)
		30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	
<b>T<sub>1</sub> : Control</b>	19.22	3.11	6.78	9.56	0.22	0.22	0.44	4.44	6.33	7.89	5.33	5.96	6.44	14.89
<b>T<sub>2</sub> : IAA (100 ppm)</b>	17.89	3.44	7.00	9.89	0.33	0.33	0.78	4.67	6.56	9.78	7.00	7.33	7.88	15.67
<b>T<sub>3</sub> : IAA (300 ppm)</b>	16.33	3.56	7.67	11.33	0.44	0.56	1.33	5.56	7.67	10.33	8.44	8.94	9.00	16.78
<b>T<sub>4</sub> : IAA (500 ppm)</b>	13.56	3.67	8.11	13.78	0.56	0.78	1.44	6.56	9.11	12.22	8.89	9.23	9.92	18.89
<b>T<sub>5</sub> : IBA (100 ppm)</b>	12.67	3.89	9.56	14.11	0.67	0.89	1.56	6.78	9.22	12.44	9.99	10.60	11.39	20.89
<b>T<sub>6</sub> : IBA (300 ppm)</b>	11.22	4.11	10.67	14.22	0.78	1.00	1.78	6.89	9.67	13.11	10.71	11.44	12.01	21.11
<b>T<sub>7</sub> : IBA (500 ppm)</b>	10.89	4.22	12.22	15.56	0.89	1.33	2.00	7.00	10.44	13.33	12.01	12.76	13.77	25.78
<b>T<sub>8</sub> : IAA + IBA (100 ppm + 500 ppm)</b>	9.00	5.67	13.89	16.56	1.11	1.89	2.56	7.89	13.11	15.56	14.78	15.87	16.44	29.00
<b>T<sub>9</sub> : IAA + IBA (500 ppm + 100 ppm)</b>	10.56	4.56	13.11	16.11	1.00	1.56	2.33	7.22	13.00	15.44	13.02	13.76	14.89	26.78
<b>S.E.d (±)</b>	0.59	0.35	0.95	0.86	0.15	0.17	0.24	0.37	0.71	0.66	0.43	0.38	0.60	1.09
<b>C.D. (p=0.05)</b>	1.25	0.75	2.02	1.83	0.33	0.35	0.51	0.79	1.50	1.41	0.92	0.81	1.27	2.32
<b>CV (%)</b>	5.37	10.72	11.72	7.86	29.26	21.34	18.55	7.18	9.19	6.65	5.31	4.37	6.51	6.36