

INFLUENCE OF IBA AND NAA ON ROOTING OF TERMINAL CUTTINGS OF CHRYSANTHEMUM (*Dendranthema grandiflora* L.)

ABSTRACT

The present investigation was conducted at the Agricultural College and Research Institute, Vazhavachanur, Tiruvannamalai to study the effect of Indole-3-Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA) on the rooting of terminal cuttings of chrysanthemum. An application of growth regulators (IBA and NAA) had a positive effect on the rooting of chrysanthemum terminal cuttings. The result of the experiment revealed that the treatment of IBA @ 400ppm significantly increased rooting percentage (89%), length of roots (5.67 cm), root spread (39.18 cm), number of roots (22.67), fresh weight of roots (4.94 g), plantlet weight (1.17 g), and plant height (8.87 cm).

Key words: *Dendranthema grandiflora*, Terminal cuttings, Indole-3-Butyric Acid (IBA), Naphthalene Acetic Acid (NAA).

INTRODUCTION

India has diverse agro-climatic conditions, and flower crops are cultivated throughout the year in conventional and non-conventional areas. Floriculture is a fast growing agro-industry and has been associated with social culture and heritage in India. Since ancient times, it has been a tradition of growing flowers largely for religious purposes, the perfume industry, and landscaping. Chrysanthemum (*Dendranthema grandiflora* L.) belongs to the family Asteraceae, a popular perennial flowering plant, second only to roses in the international flower trade. It is known for its long vase life and comes in a wide range of types, sizes, and colors. Chrysanthemum is used both as cut and loose flowers. Loose flowers are used for making garlands and for social and religious functions. Standard chrysanthemums are grown for cut flowers in bouquets and vase decorations (Singh and Chettri, 2013; Manjunath et al., 2022). In India, it is commonly propagated through terminal cuttings and suckers from June to August. The propagation by stem cuttings is more feasible with the application of auxins. However, the root development percentage is low in some varieties, which can overcome by the use of growth regulators. The effect of IBA and NAA on rooting of chrysanthemum terminal cuttings indicated that cuttings with IBA at 400ppm performed well concerning the

root development percentage (Grewal *et al.*, 2005). Sidhu and Singh (2002) studied the effect of auxins on the rooting of terminal cuttings of *Chrysanthemum morifolium* cv. Flirt and recorded the highest number of roots per cutting with IBA at 250 ppm. The treatment of cuttings with auxins increases the number of adventitious roots that can naturally regenerate into roots. However, their effectiveness varies among different species and varieties. Rooting in chrysanthemum cuttings is facilitated by auxins, such as Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA), and Indole Acetic Acid (IAA), which are commonly applied in liquid or powder form to promote rooting (Poteza, 2020). The present study investigates the effect of Indole-3-Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA) on the rooting of terminal cuttings of chrysanthemum.

MATERIALS AND METHODS

The present investigation was conducted in a shade net house at Agricultural College and Research Institute, Vazhavachanur, Tiruvannamalai, Tamil Nadu. The experiment was laid out in Completely Randomized Design (CRD) with twelve treatments and three replications. The treatment details are furnished in Table 1. The required quantity of growth regulators IBA and NAA were carefully weighed using an electronic balance and dissolved in 10 ml of 95% ethyl alcohol with thorough shaking. The same was transferred to a volumetric flask to make the required volume with water. The growth regulators were prepared at 100, 200, 400, and 800 ppm concentrations. The chrysanthemum terminal cuttings were soaked with the growth regulators at different concentrations for 24 hours. River sand was treated with 0.2% carbendazim fungicide to prevent soil diseases. Same size pots were selected and filled with the media. Cocopeat was used as the rooting medium, filled into portraits. All pots were kept in partial shade. The rooting percentage, length of roots (cm), root spread (cm), number of roots plantlet⁻¹, fresh weight of roots (g), plantlet weight (g), and plant height (cm), were recorded in each treatment. The data were statistically analysed following the procedures outlined by Panse and Sukhatme (1967).

Table: 1. Treatment details

Treatments

T ₀ - Control (water spray)
T ₁ - IBA @ 100ppm
T ₂ - IBA @ 200ppm
T ₃ - IBA @ 400ppm
T ₄ - IBA @ 800ppm
T ₅ - NAA @ 100ppm
T ₆ - NAA @ 200ppm
T ₇ - NAA @ 400ppm
T ₈ - NAA @ 800ppm
T ₉ - IBA 100ppm + NAA @ 100ppm
T ₁₀ - IBA 200ppm + NAA @ 200ppm
T ₁₁ - IBA 400ppm + NAA @ 400ppm

RESULTS AND DISCUSSION

The effects of different concentrations of auxins varied significantly among treatments in terms of cutting length, rooting percentage, number of roots per cutting, root length, days to root initiation, and plant survival in pots, as shown in Table 2. The observation on rooting revealed that all the growth regulators had significant effect on rooting percentage (Table 2). The maximum rooting percentage was recorded in IBA @ 400 ppm (89%), followed by NAA @ 400 ppm (79.33%), while minimum rooting percentage (47) was observed in control (Figure 1). The results are also in conformity with the findings of Cuquel and Minami (1994) and Read and Hoyster (1969). It was also found that all the growth regulator treatments showed significant effect on length of roots. The maximum root length (5.67 cm) was observed in IBA @ 400 ppm followed by IBA @ 100 ppm + NAA @ 100 ppm combination (5.17cm), whereas minimum length of roots (3.60cm) was recorded in control. Similar result

was obtained by Grewal *et al.* (2005), Beshe and Nagesh (1998) in *Juniperus procera* and Nagaraja, *et al.* (1991) in jasmine.

All the growth regulator treatments showed a significant effect on root spread as compared to the control. The maximum root spread (39.18cm²) was observed in IBA @ 400 ppm followed by NAA @ 800 ppm (38.89cm²) and it was minimum in control (25.27cm²). Indole butyric acid treatment recording maximum root spread in chrysanthemum cuttings was also observed by Grewal *et al.* (2005). The growth regulators showed a significant effect on the number of roots plantlet⁻¹. The maximum number of roots per cutting (22.67) was recorded in IBA @ 400 ppm, followed by IBA @ 100 ppm + NAA @ 100 ppm combination (20.67) as compared to control (15.67).

Shin and Lee (1997) also reported that IBA treated cuttings had increased the number of roots per cutting in chrysanthemum. Sharma *et al.* (1978) also observed similar results in carnation stem cutting. Bose and Mandal (1973) obtained not only high percentage of rooting but also a large number of roots in many root trees and climbers by treating with IBA and NAA in talc. The growth regulators had a significant effect on the fresh weight of roots. The maximum fresh weight of roots (4.94g) was observed in IBA @ 400 ppm, followed by IBA at 400 ppm (4.10g) while the minimum fresh weight of roots (2.88g) was recorded in control. A similar result was obtained in the stem cuttings of chrysanthemum by Sidhu and Singh (2002) and Grewal *et al.* (2005). All the treatments showed a significant effect on plantlet weight. The maximum plantlet weight (1.17g) was also recorded in IBA at 400 ppm, followed by IBA at 200 ppm (0.93g). A similar results were obtained in chrysanthemum cuttings by Grewal *et al.* (2005) and Samanda *et al.* (1972). The plant height was also influenced by the growth regulator treatments. The maximum plant height (8.87cm) was recorded in IBA at 400 ppm, followed by IBA at 400 ppm (8.57cm), Sharma *et al.* (1978) and Samanda *et al.* (1972) also obtained increased plant height with IBA treatment.

REFERENCES

- Beshe, D. and L. Nagesh (1998). A sexual propagation of *Juniperus procera* from Ethiopia; a contribution. *Forest Ecology and Management*, 112: 179-190.
- Bose, T.K. and D.P. Mandal (1973). Rooting of cutting under mist. *Indian J. Agric. Sci.* 43 (3): 229-233.

- Cuquel, F.L. and K. Minami (1994). Rooting of chrysanthemum cuttings treated with IBA applied in talc. *Scientia Agricola*, 51:28-35.
- Grewal, H.S., Kumar, Ramesh, Chauhan and Rapinder (2005). Effect of IBA and NAA on rooting in Chrysanthemum (*Dendranthema grandiflora*) terminal cuttings. *J. Orna. Hort.*, 8(3): 230-232.
- Indian Horticulture Data Base (2006). Area, production and productivity of flowers, *National Horticulture Board*, Gurguan,3-4.
- Nagaraja, G.S., B.G.M. Raj and T.R. Guru Prasad (1991). Effect on intermittent mist and growth regulators on propagation of *Jasminum grandiflorum* by different types of cuttings. *Haryana J. Hort. Sci.*, 20: 183-188.
- Panse, V.C. and Sukhatme, P.V.(1967). Statistical methods for agricultural workers. 2nd edition, ICAR, New Delhi. 328 p.
- Samanda, N., D.P. Ormvod and N.O. Adedipe (1972). Rooting of chrysanthemum stem cuttings as affected by phosphonic acid and IBA. *Ann. Bot.*, 63: 961-965.
- Sharma, R.K., V.P. Singh, D.S. Pande and H.R. Misra (1978). Effect of IAA and IBA on growth and flowering of chrysanthemum Cv. *Margaerite*, *Plant Sci.*, 10: 179-181.
- Shin, H.J. and J.M. Zee (1997). Effect of propagation methods and growth regulators on chrysanthem cuttings. *J. Korean Soc. Hort. Sci.*, 20:111-116.
- Sidhu, G.S. and Singh, P. (2002). Effect of auxins on propagation in chrysanthemum moriflorum. *Ind. Flor. in the new millennium, Lal Bagh, Bangalore*, 25-27.
- Zimmerman, P.W. and Hitchcock, A.E. (1940). Initiation and stimulation of adventitious roots by unsaturated hydrocarbon gas. *Contr. Boyce Thomas Inst.*, 5:351-369.
- Manjunath DR, Patil RT, BC Patil, Mukund Shiragur, Sachin Kumar T Nandimath and Srikantaprasad D. Effect of auxins on rooting of terminal cuttings of chrysanthemum (*Dendranthema grandiflora*). *The Pharma Innovation Journal*. 2022; 11(3): 1436-1439.
- Poteza, G. J. (2020). Effect of rooting hormone and media on propagation of chrysanthemum (*Dendranthema grandiflorum* Ramat Kitam.), M.Sc. (Agri.) Thesis, Punjab Agri. Univ., Ludhiana (India).

Singh P, Chettri R. A new propagation method for rapid multiplication of chrysanthemum under *in vivo* conditions. Int. J Conserv. Sci. 2013;4(1):95-100.

UNDER PEER REVIEW

Table 2. Effect of IBA and NAA on rooting percentage, length of roots (cm), root spread (cm²), no. of roots plantlet⁻¹, fresh weight of roots (g) and height of plant in Chrysanthemum terminal cuttings.

	Treatments	Rooting Percentage	Length of roots (cm)	Root spread (cm ²)	No. of roots plantlet ⁻¹	Fresh weight of roots (g)	Weight of plantlet (g)	Height of plant (cm)
T ₁	IBA @ 100 ppm	53.00	3.83	30.57	17.67	3.29	0.68	7.70
T ₂	IBA @ 200 ppm	60.00	4.50	34.78	17.00	3.12	0.93	7.73
T ₃	IBA @ 400 ppm	89.00	5.67	39.18	22.67	4.94	1.17	8.87
T ₄	IBA @ 800 ppm	75.67	4.27	31.29	20.67	4.10	0.59	8.57
T ₅	NAA @ 100 ppm	59.00	3.80	30.09	17.00	3.08	0.58	7.93
T ₆	NAA @ 200 ppm	53.00	4.13	29.66	16.33	2.93	0.63	7.63
T ₇	NAA @ 400 ppm	79.33	4.47	34.44	20.00	3.71	0.75	8.03
T ₈	NAA @ 800 ppm	55.00	4.67	38.89	18.00	3.78	0.77	8.47
T ₉	IBA @ 100 ppm + NAA @ 100 ppm	71.00	5.17	29.17	20.67	3.43	0.77	7.67
T ₁₀	IBA @ 200 ppm + NAA @ 200 ppm	55.00	4.20	27.52	17.00	3.44	0.61	7.83
T ₁₁	IBA @ 400 ppm + NAA @ 400 ppm	52.33	4.10	26.61	16.33	3.44	0.60	7.33
T ₁₂	Control (water/spray)	47.00	3.60	25.27	15.67	2.88	0.52	7.17
	F-test	S	S	S	S	S	S	S
	S. Ed (±)	2.37	0.09	0.59	0.43	0.10	0.04	0.12
	C. D.(P= 0.05)	4.89	0.18	0.22	0.89	0.22	0.08	0.26

Figure 1. Effect of IBA and NAA in different concentration on rooting percentage.

