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Effect of auxins on rooting of terminal cuttings of chrysanthemum (*Dendranthema grandiflora*)

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Abstract
The experiment was carried out during December-June of 2020-2021 in the mist house of Department of Floriculture and Landscape Architecture, Kittur Rani Channamma College of Horticulture, Arabhavi. The experiment was laid out in Completely Randomized Design (CRD) with 13 treatments and replicated thrice. The effect of different auxins with various concentrations significantly differed among the treatments. Longest shoot (11.77 cm), maximum fresh weight (3.47 g) and dry weight (0.35 g), early rooting (5.33 days), longest root (7.73 cm), maximum percentage of rooting (100%) and survival percentage (100%) of rooted cuttings was observed in terminal cuttings of Chrysanthemum treated with IBA+NAA @ 300 ppm followed by NAA at 200 ppm.

Keywords: Chrysanthemum, terminal cuttings, auxins, rooting percentage, survival percentage

Introduction
Chrysanthemum (*Dendranthema grandiflora*) is one of the major cut flowers in the world trade. Chrysanthemum is an herbaceous perennial flowering plant extensively grown all over the world for its beautiful charming flowers with an excellent vase life. It ranks second in the international flower trade after rose and was labeled as the 'divas' or 'queen' of autumn gardens. It is believed to be native of northern hemisphere, mainly Europe and Asia. Chrysanthemum is versatile flower with a wide range of types, sizes and colors. The erect and tall growing types (standard chrysanthemums) are grown as cut flowers for making bouquets and vase decoration (Singh and Chettri, 2013) [8]. The plant has the ability to grow from stem cuttings. Each cutting should be minimum 5 inches long and have some foliage so that photosynthesis can occur and each cutting produces energy to generate roots (Muraleedharan *et al*., 2020) [6]. Chrysanthemum cut flowers produced by traditional growers have poor physical performance and quality due to lack of good planting material and cultivation method, therefore their prices become uncompetitive and less profitable. The rooting capacity is not only determined by the genotype, but also by environmental conditions (Horridge and Chockshull, 1989) [3]. Chrysanthemum is commercically propagated through terminal cuttings and are also propagated through root suckers but they produce tall plants, which are not suitable for decorative purpose, this makes terminal cuttings highest suitable method for its propagation because it is cheap, rapid and true to type (Waseem *et al.*, 2011) [9]. But these cuttings have low propagation rate which promote the importance and use of rooting hormone to improve rooting, root initiation, uniformity, number and quality of roots (Mukherjee, 2008) [5]. Rooting in chrysanthemum by using terminal cuttings is easy but needs more care, the treatment of cuttings with rooting hormones for root initiation was a major milestone in the history of plant propagation especially with discovery of auxins in 1934 (Debasis *et al*., 2000) [2]. Among all the rooting hormones, auxins are commonly used for rooting like Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA) and Indole Acetic Acid (IAA) that are applied in liquid or in powder form for promoting rooting of stem cuttings. Auxin treatment can also influence high rooting percentage and quality of root system. The purpose of treating cuttings with rooting hormone is to hasten root initiation, increase the percentage of cuttings which forms roots, and increases the number of roots. The treatment of cuttings with auxins increased the number of adventitious roots that are naturally able to regenerate in to roots; however, their effectiveness varies among different species and varieties (Poteza, 2019).

Material and Methods

The experiment was carried out in the mist house of Department of Floriculture and Landscape Architecture, Kittur Rani Channamma College of Horticulture, Arabhavi during December 2020 to June 2021. The maximum temperature during the experiment was 32.55 ºC and relative humidity of 88.59 percent. The planting material was obtained from uniformly grown plants of chrysanthemum planted at the Department of Floriculture and Landscape Architecture nursery of KRCCH, Arabhavi. The terminal cuttings of *Dendranthema grandiflora* were taken from "Cent White" Variety mother plot, each cutting were of 4-5cm length having one or two buds for root initiation. The rooting media was cocopeat, which was filled into the protrays. Thirteen auxin formulations were used at various concentrations, with twenty cuttings used for each treatment, which was replicated three times. The prepared cuttings were immersed in a variety of auxin concentrations and combinations. The cuttings' basal 1.0-2.0 cm part was dipped in auxins formulation for 2 minutes before being planted in media to a depth of 2 cm. After cuttings were planted, the misting was started. The mist house which had the arrangement for intermittent misting to 2 minutes at every 30 minutes interval between 9 AM and 5 PM. The planted cuttings were allowed to root for 20 days. The cuttings were carefully removed from the protrays and washed in water to remove the media particles adhering to roots to record the observations pertaining to roots *viz*., days taken for root initiation, rooting percentage, length of longest root, number of roots, fresh and dry weight of roots and per cent success after 20 days of planting. Different shoot characters observations were also recorded after planting. The data pertaining to root and shoot character were tabulated. The experiment was laid Completely Randomized Design (CRD) with 13 treatments replicated thrice and statistically analysed as per the methods outlined by (Cochran and Cox, 2) by adopting Fishers analysis of variance techniques. Treatment details are represented in Table 1.

Table 1: Details of treatments

T_1	Control	T_6	NAA-200 ppm	T_{11}	IBA+NAA- 300 ppm
T_2	IBA-200 ppm	T_7	NAA-300 ppm	T_{12}	IBA+NAA-400 ppm
T_3	IBA-300 ppm	T_8	NAA-400 ppm	T_{13}	IBA+NAA-500 ppm
T_4	IBA-400 ppm	T_9	NAA-500 ppm		
T_5	IBA-500 ppm	T_{10}	IBA+NAA- 200 ppm		

Results and Discussion

The effect of different auxins with various concentration significantly differed among the treatments on cuttings length, fresh weight of shoot, dry weight of shoot, percentage of rooting, number of roots per cutting, root length, days required for root initiation and plant survivability in pots reflected in Table 2, 3 and 4. The cuttings treated with IBA+NAA at 300 ppm resulted in maximum root length at 10 and 20 DAP (6.07 cm and 11.77 cm, respectively), which was on par with the cuttings treated with NAA at 200 ppm (5.70 cm and 11.43 cm, respectively). The minimum shoot length was recorded in control (4.17 cm and 8.50 cm, respectively). Maximum fresh weight (3.47 g) was recorded in the cuttings treated with IBA+NAA at 300 ppm, which was on par with the cuttings treated with NAA at 200 ppm (3.31 g) and IBA at 400 ppm (3.15g). The minimum fresh weight was observed in control (2.06g). The cuttings treated with IBA+NAA at 300 ppm resulted in maximum dry weight (0.35 g), which was on par with the cuttings treated with NAA at 200 ppm (0.34 g) and IBA at 400 ppm (0.33 g). The minimum dry weight is found in control (0.24 g). These results may be due to increase in cell division and better utilization of carbohydrates and nitrogen. Cuttings treated with IBA+NAA at 300 ppm had the shortest rooting time (5.33 days), which was comparable to cuttings treated with NAA at 200 ppm (5.63 days). The maximum number of days required for rooting was discovered in the control group (10.93), which may be due to translocation of endogenous auxins to the cut ends and exogenous IBA increased the cell division and cell elongation (Yusnita *et al*., 2017) [10]. The cuttings treated with IBA+NAA at 300 ppm had the longest root length (7.73 cm), followed by NAA at 200 ppm (6.87 cm) and IBA at 400 ppm (6.87 cm) (6.71 cm). In the control group, the root length was determined to be the shortest (5.13 cm). Increased root length may be due to early initiation of roots leading to more consumption of nutrients (Jadhav, 2007) [4]. Maximum number of roots (59.27) was found in the cuttings treated with IBA+NAA at 300 ppm, which was on par with the cuttings treated with NAA at 200 ppm (57.40). The minimum number of primary roots was found in control (26.00). This result might be due to high rate of cell division and enlargement leads to produce more roots. The cuttings treated with IBA+NAA at 300 ppm resulted in maximum fresh weight (1.72 g), which was on par with the cuttings treated with NAA at 200 ppm (1.60 g) and IBA at 400 ppm (1.47 g). The minimum fresh weight was found in control (0.78 g), which might be due to high cell density and more uptake of nutrient and water which adds to its weight. The cuttings treated with IBA+NAA at 300 ppm resulted in maximum dry weight (0.16 g), which was on par with the cuttings treated with NAA at 200 ppm (0.15 g) and IBA at 400 ppm (0.14 g). The minimum dry weight was found in control (0.10 g). The 100 percent rooting was observed in all treatments which may be due to juvenility of the planting material. The higher rooting due to IBA application as it increases the cell wall plasticity and cell division, stimulation of callus development and root growth. The cuttings treated with IBA+NAA at 300 ppm resulted in maximum survival percentage (100%), which was on par with the cuttings treated with NAA at 200 ppm (99%) and IBA at 400 ppm (99%). The minimum survival percentage was found in control (95.67%). This is because of more number of longer primary and secondary roots helps in surviving after transplantation.

Table 2: Shoot Parameters as influenced by different auxins in the cuttings of chrysanthemum

Treatments	Length of shoot (cm)		Weight of shoot (g)	
	10 DAP	20 DAP	Fresh weight	Dry weight
T_1: Control	4.17	8.50	2.06	0.24
T_2: IBA @ 200 ppm	5.57	11.07	2.78	0.29
T_3: IBA @ 300 ppm	4.83	9.83	2.36	0.24
T_4: IBA @ 400 ppm	5.67	11.37	3.15	0.33
T_5: IBA @ 500 ppm	5.27	10.78	2.74	0.28

T_6: NAA @ 200 ppm	5.70	11.43	3.31	0.34
T_7: NAA @ 300 ppm	4.67	9.33	2.30	0.24
T_8: NAA @ 400 ppm	5.24	10.78	2.54	0.27
T_9: NAA @ 500 ppm	5.40	10.83	2.75	0.28
T_{10}: IBA+NAA @ 200 ppm	5.60	11.17	2.86	0.29
T_{11}: IBA+NAA @ 300 ppm	6.07	11.77	3.47	0.35
T_{12}: IBA+NAA @ 400 ppm	4.53	9.20	2.21	0.23
T_{13}: IBA+NAA @ 500 ppm	5.63	11.33	2.88	0.31
S.Em ±	0.13	0.24	0.10	0.01
C.D @ 5%	0.38	0.70	0.31	0.02

DAP- Days after planting

Table 3: Days taken for rooting, length of longest root, number roots as influenced by different auxins in cuttings of chrysanthemum

Treatments	Days taken for rooting	Length of longest root (cm)	Number of roots
T1: Control	10.93	5.13	26.00
T2: IBA @ 200 ppm	6.67	6.50	41.27
T3: IBA @ 300 ppm	7.13	6.10	36.53
T4: IBA @ 400 ppm	6.07	6.71	43.67
T5: IBA @ 500 ppm	6.77	6.20	38.13
T6: NAA @ 200 ppm	5.63	6.87	57.40
T7: NAA @ 300 ppm	7.53	5.87	36.47
T8: NAA @ 400 ppm	6.93	6.17	37.67
T9: NAA @ 500 ppm	6.73	6.37	40.00
T10: IBA+NAA @ 200 ppm	6.63	6.53	41.93
T11: IBA+NAA @ 300 ppm	5.33	7.73	59.27
T12: IBA+NAA @ 400 ppm	8.60	5.76	30.47
T13: IBA+NAA @ 500 ppm	6.33	6.70	42.13
S.Em ±	0.16	0.13	0.92
C.D @ 5%	0.46	0.38	2.69

Table 4: Fresh weight of root and dry weight of root and survival percentage as influenced by different auxins in cuttings of chrysanthemum

Treatments	Weight of root		Survival percentage (%)
	Fresh weight (g)	Dry weight (g)	
T_1: Control	0.78	0.10	95.67
T_2: IBA @ 200 ppm	1.21	0.12	97.67
T_3: IBA @ 300 ppm	1.07	0.11	96.33
T_4: IBA @ 400 ppm	1.47	0.14	99.00
T_5: IBA @ 500 ppm	1.30	0.12	97.00
T_6: NAA @ 200 ppm	1.60	0.15	99.00
T_7: NAA @ 300 ppm	1.03	0.10	96.00
T_8: NAA @ 400 ppm	1.10	0.12	97.00
T_9: NAA @ 500 ppm	1.17	0.12	97.33
T_{10}: IBA+NAA @ 200 ppm	1.24	0.12	98.00
T_{11}: IBA+NAA @ 300 ppm	1.72	0.16	100.00
T_{12}: IBA+NAA @ 400 ppm	0.98	0.11	96.00
T_{13}: IBA+NAA @ 500 ppm	1.29	0.13	98.33
S.Em ±	0.10	0.04	0.76
C.D @ 5%	0.31	0.11	2.21

Conclusion

As per the results obtained and discussion given above, it can be concluded that IBA+NAA at 300 ppm is best for the early emergence of roots, highest number of roots, rooting percentage and has greater survival percentage and the next best treatment was found to be NAA at 200 ppm in the terminal cuttings of chrysanthemum (*Dendranthema grandiflora*).

Reference

1. Cochran WG, Cox GM. Experimantal Designs. John Wiley and Sons Inc. New York. 1992.
2. Debasis C, Mandal AKA, Datta SK. Retrieval of new coloured chrysanthemum through organogenesis from sectorial chimera. Current Science. 2000;78(9):1060-1061.
3. Horridge JS, Cockshull KE. The effect of the timing of a night-break on flower initiation in *Chrysanthemum morifolium* Ramat. J Hort. Sci. 1989;64(2):183-188.
4. Jadhav AS. Studies on propagation of phalsa (*Grewia subinaequalis*) by cuttings. Ph. D. Thesis, Univ. Agri. Sci., Dharwad (Karnataka). 2007.
5. Mukherjee D. Speciality Cut Flowers Production Technologies, Naya Udyog, Kolkata, India. 2008.
6. Muraleedharan A, Sha K, Kumar S, Joshi JL, Kumar CPS. Rooting capacity of chrysanthemum cuttings by using different types of growing media. Plant Archives. 2020;20(1):2502-2504.
7. Poteza GJ. Effect of rooting hormone and media on propagation of chrysanthemum (*Dendranthema grandiflorum* Ramat Kitam.), M.Sc. (Agri.) Thesis, Punjab Agri. Univ., Ludhiana (India). 2020.

8. 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.
9. Waseem K, Jilani MS, Jaskani MJ, Khan MS, Kiran M, Khan GU. Significance of different plant growth regulators on the regeneration of chrysanthemum plantlets (*Dendranthema morifolium* L.) through Shoot Tip Culture. Pak J. Bot. 2011;43:1843-48.
10. Yusnita Y, Jamaludin J, Agustiansyah A, Hapsoro D. A combination of IBA and NAA resulted in better rooting and shoot sprouting than single auxin on Malay apple [*Syzygium malaccense* (L.) Merr. and Perry] stem cuttings. J Agric. Sci., 2017;40(1):80-90.