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Effect of sampling time and auxins concentration on rooting of chrysanthemum cv. Chandamama yellow

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Abstract
An experiment was conducted at Floriculture Research Station, (Agricultural Research Institute) Rajendranagar, Hyderabad during August 2018 to October 2018 to study "Effect of sampling time and auxins concentration on rooting of Chrysanthemum cultivar Chandamama Yellow". The cuttings were taken in three different months of August, September and October and treated with different auxins concentration of IBA, NAA and Rootex-1 powder along with control (distilled water) to study rooting ability. The study revealed that significant differences were recorded in Chrysanthemum cultivar Chandamama Yellow. Among different sampling times, the cuttings taken in August recorded minimum days taken to rooting (11.84 days), maximum root length (9.66 cm), number of roots per cutting (16.91), rooting percentage (90.63 %), fresh weight of roots (0.63 g) and dry weight of roots (0.09 mg). Among different auxins concentration minimum days taken to rooting (10.56 days), maximum root length (11.03 cm), maximum number of roots per cutting (20.56), rooting percentage (92.00 %), fresh weight of roots (0.95 g) and dry weight of roots (0.13 mg) was recorded with IBA 500 ppm. Among different treatment combinations minimum days taken to rooting (8.20 days), maximum root length (11.07 cm), maximum number of roots per cutting (22.47), rooting percentage (96.33 %), fresh weight of roots (1.26 g), dry weight of roots (0.20 mg) was recorded with cuttings taken in August + IBA 500 ppm at nursery condition.

Keywords: Chrysanthemum, samplingtime, auxins concentration, rooting ability

Introduction
Chrysanthemum is a 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 plants can be propagated both sexually and through vegetative means. Since chrysanthemum is highly cross-pollinated and due to its polyploidal and heterozygous nature, a wide range of variations are observed when grown from seeds and the plants also possess sporophytic self-incompatibility. A commercial method of propagation is through terminal stem cuttings taken from healthy mother plants.

Plant growth regulators play an important role in manipulating growth, flowering and rooting behaviour in flower crops. Exogenous auxin application improves rooting efficiency and quality of stem cuttings. While IBA and NAA stimulate adventitious rooting in cuttings (Copes and Mandel, 2000) [2]. Auxin contain some synergistic components such as diphenyls, these compounds stimulate the related RNAs biosynthesis and hence improve the roots primordia initiation (Henrique *et al*. 2006) [5]. The effectiveness of auxins, however, varies not only with the nature and concentration of the auxin and the plant species, but also with season. (Nanda and Kochhar, 1985) [9].

Materials and Methods
This experiment was conducted at Floriculture Research Station, (Agricultural Research Institute) Rajendranagar, Hyderabad during August 2018 to October 2018. Experiment was designed in Completely Randomized Design with Factorial concept with three replications and

the cuttings were planted on portray and placed at mist chamber. Auxins concentrations used were 50,100,250 and 500 ppm and sampling times taken were July, August and September. Chrysanthemum cuttings 5-7 cm long with 3-4 buds were selected for root initiation. The cuttings were treated with one per cent Captan to prevent the occurrence of fungal disease later, cuttings basal ends were dipped in PGRs solution for10 minutes. Well sieved soil, sand, cocopeat, FYM (1:1:0.5:0.5) proportion were mixed to prepare growing media. Cells of protrays were filled with this growing media and sampling was around in one month intervals during July, August and September. 45 days after the treatment, rooted cuttings were observed for the rooting percentage, roots number, roots fresh weight, longest root and survival rate.

Results and Discussion

Days taken to rooting

Among different sampling times, August (S_1) recorded significantly minimum time taken for rooting (11.40 days) and among auxin concentrations the minimum days taken for rooting (10.56 days) was noticed in the treatment IBA 500 ppm (T_4). The interaction between different sampling times and auxins concentration had significant influence on time required for rooting. The results showed that minimum time taken for rooting (8.20) was observed in August + IBA 500 (S_1T_4) ppm.

The early rooting in August + IBA 500 ppm might be due to the internal auxin concentration sufficient for root induction of cuttings. It has been reported that auxin existence is necessary for induction of the root starter cells. Similar findings have been reported by Kazankaya *et al*. (2005) in case of cultivars of rose.

Root length (cm)

Among sampling times, August (S_1) was found to be superior by recording maximum root length (9.66 cm). Among the different Auxins concentrations, IBA 500 ppm (T_4) recorded significantly highest root length (11.03 cm) per cutting. The interaction of sampling time and auxins concentration had significant influence on root length per cutting and maximum root length (11.07 cm) was observed in August + IBA 500 ppm (S_1T_4).

Favourable climatic conditions in August increased the length of root. The increase in length of roots in cuttings treated with growth regulators might be due to the enhanced hydrolysis of carbohydrates, accumulation of metabolites at the site of application of auxins, synthesis of new proteins, cell enlargement and cell division induced by the auxins (Strydem and Hartman, 1960) [12]. The present findings are similar to the findings of Panwar *et al*. (2001) [10] in pomegranate cuttings.

The maximum root length when treated with IBA shows that it is likely that these hormones initiate synthesis of structural or enzyme proteins in the process of adventitious root formation. The increase in the root length through the process of acidification caused by auxin application to cuttings was explained by Bharathy *et al* (2004) [1] in carnation.

Table 1: Effect of Sampling time and Auxins concentration on days taken to rooting and root length (cm) in Chrysanthemum Cv. 'Chandamama yellow'

Auxins concentration (T)		Days taken to rooting				Root length (cm)			
		Sampling time (S)				Sampling time (S)			
		August (S_1)	September (S_2)	October (S_3)	Mean	August (S_1)	September (S_2)	October (S_3)	Mean
T_1	IBA 50 ppm	12.40	15.47	16.20	14.69	8.31	8.24	8.18	8.24
T_2	IBA 100 ppm	11.70	14.60	15.40	13.90	10.26	10.19	9.62	10.02
T_3	IBA 250 ppm	10.53	12.73	14.20	12.49	10.68	10.48	9.85	10.33
T_4	IBA 500 ppm	8.20	10.20	13.27	10.56	11.07	11.01	11.02	11.03
T_5	NAA 50 ppm	14.60	16.53	17.13	16.09	8.68	8.57	8.56	8.60
T_6	NAA 100 ppm	13.67	15.67	16.47	15.27	8.82	8.69	8.70	8.74
T_7	NAA 250 ppm	12.60	13.80	15.20	13.87	10.36	10.24	10.11	10.23
T_8	NAA 500 ppm	11.13	12.40	14.60	12.71	10.56	10.33	10.54	10.47
T_9	Rootex-1 powder	9.07	11.20	13.93	11.40	11.03	10.50	10.51	10.85
T_{10}	Control (Distilled water)	14.47	17.53	18.20	16.73	6.37	6.40	6.30	6.36
Mean		11.84	14.01	15.46		9.66	9.47	9.34	
For comparing the means of		SEm±		CD @ 5%		SEm±		CD @ 5%	
S (Sampling time)		0.04		0.12		0.02		0.06	
T(Auxins concentration)		0.08		0.23		0.04		0.11	
S X T		0.13		0.39		0.07		0.19	

Number of roots per cutting

The results showed that August (S_1) recorded maximum number of roots (16.91) among different sampling times where as IBA 500 ppm significantly showed highest number of roots per cutting (20.56) in different auxins concentrations. Maximum number of roots per cutting (22.47) was observed in August + IBA 500 ppm treatment combination.

Increased rooting response of IBA in cuttings may be attributed to induction of more vigorous cell division at the basal end of cutting and increases accumulation of sugars, which favours callus formation and subsequently rooting. These findings are in agreement with the results recorded by Mishra and Sharma (1995) [7] in Bougainvillea and Nagaraja *et al*. (1991) [10] in Jasminum.

Table 2: Effect of Sampling time and Auxins concentration on number of roots per cutting in Chrysanthemum Cv. 'Chandamama Yellow'.

Auxins concentration (T)		Sampling time (S)			Mean
		August (S_1)	September (S_2)	October (S_3)	
T_1	IBA 50 ppm	15.60	14.60	13.73	14.64
T_2	IBA 100 ppm	16.60	15.67	14.40	15.56
T_3	IBA 250 ppm	17.53	16.73	14.87	16.38
T_4	IBA 500 ppm	22.47	20.60	18.60	20.56
T_5	NAA 50 ppm	14.67	14.33	13.33	14.11
T_6	NAA 100 ppm	15.33	15.33	13.73	14.80
T_7	NAA 250 ppm	17.40	15.60	14.40	15.80
T_8	NAA 500 ppm	18.40	16.53	14.83	16.59
T_9	Rootex-1powder	21.00	18.60	16.60	18.73
T_{10}	Control (Distilled water)	10.40	9.73	8.53	9.56
Mean		16.91	15.77	14.30	
For comparing the means of		SEm±		CD @ 5%	
S (Sampling time)		0.04		0.11	
T(Auxins concentration)		0.07		0.20	
S X T		0.13		0.35	

Rooting percentage

Among different sampling times, August (S_1) recorded significantly maximum rooting percentage (90.63). There were significant differences with respect to rooting percentage among the different auxins concentration. The highest rooting percentage (92.00), was noticed in the treatment IBA 500 ppm (T_4). The interaction between different sampling times and auxins concentration had significant influence on rooting percentage. The results showed that maximum rooting percentage (96.33) was observed in August + IBA 500 ppm (S_1T_4).

Favourable climatic conditions and optimum day time are the conditions for enhanced rooting in cuttings in most of the species (Hartmann *et al.*, 2002) [4]. Hence, August sampling time gave maximum rooting percentage.

Table 3: Effect of sampling time and auxins concentration on Rooting percentage (%) in chrysanthemum cv. Chandamama yellow

Auxins concentration (T)		Sampling time (S)			Mean
		August (S_1)	September (S_2)	October (S_3)	
T_1	IBA 50 ppm	89.00	83.33	79.33	83.89
T_2	IBA 100 ppm	90.33	86.67	80.67	85.89
T_3	IBA 250 ppm	92.00	87.67	84.00	87.89
T_4	IBA 500 ppm	96.33	91.00	88.67	92.00
T_5	NAA 50 ppm	87.00	79.67	76.00	80.89
T_6	NAA 100 ppm	88.00	81.33	79.33	82.89
T_7	NAA 250 ppm	90.000	84.67	83.00	85.89
T_8	NAA 500 ppm	94.00	86.33	84.33	88.22
T_9	Rootex-1powder	95.67	90.33	87.00	91.00
T_{10}	Control (Distilled water)	84.00	80.67	78.00	80.89
Mean		90.63	85.17	82.03	
For comparing the means of		SEm±		CD @ 5%	
S (Sampling time)		0.15		0.43	
T(Auxins concentration)		0.28		0.78	
S X T		0.48		1.36	

Fresh weight of roots (g)

Among different sampling times, August (S_1) sampling time recorded significantly highest fresh weight (0.63 g). Auxins concentration had significant effect on fresh weight of roots, among different concentrations of auxins, IBA 500 ppm (T_4) recorded significantly highest fresh weight of roots (0.95 g). The interaction between different sampling times and auxins concentration had significant influence on fresh weight of roots. The results showed that maximum fresh weight of roots (1.26 g) was observed in August + IBA 500 ppm (S_1T_4).

Auxin treatment induced higher number of primary and secondary roots, which might have also resulted in elongation of these roots through cell division (Debnath and Maiti, 1990) [3] and consequently accounting for higher fresh weight of roots.

Dry weight of roots (mg)

Among different sampling times, August (S_1) recorded significantly highest dry weight (0.09 mg). Among different concentrations of auxins, IBA 500 ppm (T_4) recorded significantly highest dry weight of roots (0.13 mg). In interaction the results showed that maximum dry weight of roots (0.20 mg) was observed in August + IBA 500 ppm (S_1T_4).

Auxin treatment induced higher number of roots, cell elongation of roots with cell division and consequently accounting for higher fresh weight and thus dry weight of roots. The results of the present study are in conformity with findings of Rana and Sood (2012) [11].

Table 4: Effect of sampling time and auxins concentration on fresh weight of roots (g) in chrysanthemum cv. Chandamama yellow

Auxins concentration (T)		Fresh weight of roots (g)				Dry weight of roots (mg)			
		Sampling time (S)			Mean	Sampling time (S)			
		August (S_1)	September (S_2)	October (S_3)		August (S_1)	September (S_2)	October (S_3)	Mean
T_1	IBA 50 ppm	0.36	0.28	0.26	0.30	0.06	0.05	0.04	0.05
T_2	IBA 100 ppm	0.42	0.39	0.35	0.39	0.08	0.06	0.05	0.06
T_3	IBA 250 ppm	0.79	0.70	0.68	0.72	0.09	0.07	0.06	0.07
T_4	IBA 500 ppm	1.26	0.82	0.77	0.95	0.20	0.10	0.08	0.13
T_5	NAA 50 ppm	0.32	0.30	0.28	0.30	0.05	0.04	0.03	0.04
T_6	NAA 100 ppm	0.40	0.38	0.35	0.38	0.06	0.05	0.04	0.05
T_7	NAA 250 ppm	0.72	0.69	0.53	0.65	0.08	0.07	0.05	0.07
T_8	NAA 500 ppm	0.80	0.76	0.67	0.74	0.10	0.08	0.06	0.08
T_9	Rootex-1powder	0.87	0.80	0.75	0.81	0.15	0.09	0.07	0.10
T_{10}	Control (Distilled water)	0.32	0.25	0.23	0.29	0.04	0.03	0.02	0.03
Mean		0.63	0.54	0.49		0.09	0.06	0.05	
For comparing the means of		SEm±		CD @ 5%		SEm±		CD @ 5%	
S (Sampling time)		0.01		0.02		0.002		0.005	
T(Auxins concentration)		0.01		0.04		0.003		0.009	
S X T		0.02		0.07		0.005		0.015	

Conclusions

On the basis of results obtained from the present investigation it can be concluded that the cuttings taken during August month and treated with IBA 500 ppm recoreded highest root parameters like early rooting, maximum root length, number of roots and rooting percentage.

References

1. Bharathy PV, Sonawane PC, Sasnu A. Effect of plant growth regulators, type of cutting and season on rooting of carnation (*Dianthus caryophyllus* L.) cuttings. Ind. J Hort. 2004; 61:338-341
2. Copes DL, Mandel NL. Effect of IBA and NAA on rooting Douglas fir stem cuttings. New Forest. 2000; 20(3):249-257.
3. Debnath GC, Maiti SC. Effect of growth regulators on rooting of softwood cuttings of guava (*Psidium guajava* L.) under mist. Haryana J Hort. Sci. 1990; 19:79-85.
4. Hartmann HT, Kester FT, Davies DE, Geneve RL. Plant Propagation, Principles and Practices. 7th Ed., Prentice Hall, New Jersey, 2002, 880.
5. Henrique A, Campinhos EN, Ono EO, Zambello de Pinho S. Effect of Plant Growth Regulators in the Rooting of Pinus Cuttings. Brazilian Archives of Biology and Technology. 2006; 49(2):189-196.
6. Kazankaya A, Yoruk E, Dogan A. Effect of IBA on rooting of *Rosa canina* hardwood cuttings from lake van region, Turkey. Acta. Hortic. 2005, 153-158.
7. Mishra SN, Sharma CP. Effect of plant growth regulators on rooting of stem cutting of bougainvellia. Prog. Hort. 1995; 27(1, 2):33-38.
8. Nagaraja GS, Muthaparai BG, Guruprasad TR. Effect of intermittent mist and growth regulators on propagation of *Jasminum grandiflorum* by different types of cuttings. Haryana J. Hort. Sci., 1999; 20(3, 4):183-188.
9. Nanda KK, Kochhar VK. Propagation through cuttings. In: Vegetative Propagation of Plants. Kalyani Publishers, 1985, 123-193.
10. Panwar RD, Gupta AK, Saini RS, Sharma JR. Effect of auxin on the rooting of cutting in Bougainvillea var. Mary Palmer. Haryana J Hort. Sci. 1991; 30(3, 4):215 - 216.
11. Rana RS, Sood KK. Effect of cutting diameter and hormonal application on the propagation of *Ficus roxburghii* Wall. through branch cuttings. Ann. For. Res. 2012; 55(1):69-84.
12. Strydem DK, Hartman HT. Effect of Indole butyric acid and respiration and nitrogen metabolism in Marianna 2624 plum softwood stem cuttings. Proceedings of American Society of Horticulture. 1960; 45(1, 2):81-82