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The Effect of Types of Propagule on Cut Flower Production of Chrysanthemum (Dendranthema Grandiflora Tzvelev.)

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ABSTRACT

Effect of different propagule types on two standard chrysanthemum varieties 'Yellow Star' and 'Purnima' was investigated at Dr. Y. S. Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh in FRBD during 2014.Significant differences were obtained among the cultivars for all vegetative and flower parameters. Maximum plant height (99.06 cm) was obtained in 'Yellow Star' when propagule type was tip cutting taken from secondary shoots arising from previous year plant. The number of side shoots per plant (3.34) was maximum in 'Purnima' when propagule type was suckers taken from previous year plant. The variety 'Purnima' showed maximum length of side shoots per plant (35.71 cm) when tip cutting taken from secondary shoots arising from previous year plant. Maximum plant spread was obtained in 'Yellow Star' (27.78 cm) when propagule type was suckers taken from previous year plant. Minimum number of days taken for visible bud formation 78 days was noticed in cultivar 'Purnima' when propagule type was tip cutting taken from primary shoot of stock plant. Days taken for peak flowering was minimum 99.00 days in 'Yellow Star' when propagule type was tip cutting taken from lateral shoots arising from previous year plants. However, maximum numbers of flowers per plant was obtained in 'Yellow Star' (2.67) when propagule type was suckers taken from previous year plant. Maximum duration of flowering was obtained in 'Purnima' (22.00 days) when propagule type was sucker taken from previous year plant. Maximum flower size (13.24 cm) and vase life (19.33 days) was observed in 'Purnima'. Based on the findings, it was concluded that cuttings can be taken from mother plants for three times in succession at monthly intervals.

Key words: Chrysanthemum, propagation, cut flower, cutting, sucker

I. INTRODUCTION

Chrysanthemum (Dendranthema grandiflora Tzvelev.) is an important cut flower crop of family Asteraceae (Anderson, 1987). Chrysanthemum is classified as a short day plant and cannot normally form flower buds when day length exceeds 14.5 hours and develop them when it exceeds 13.5 hours. It is traditionally regarded as an autumn flower. However, by using simple lighting or black out system, day length (night length) can be altered and the flowering time precisely controlled. In mid-hill condition of Solan district of Himachal Pradesh, it is generally planted in the month of June. Chrysanthemum plants can be propagated both sexually and through vegetative means. A commercial method of propagation is through shoot tip cuttings taken from healthy mother plants (Mukherjee, 2008). Chrysanthemum is also propagated through suckers but they produce tall plants, which are not suitable for decorative purpose. Propagation of chrysanthemum through shoot tip cutting is the most common method followed by commercial flower growers. The modern method of chrysanthemum propagation consists of raising disease free stock plant for production of cuttings. The quality material for propagation through cutting declines with advancement in age of stock plant. If cuttings are taken repeatedly from same stock plant it results in decreased quality as well as problem of premature bud formation & also reduction in size of bloom. This premature bud

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development is a problem both for growers of cut flowers and for the producers of cuttings. Plants that form buds prematurely, usually produce inferior flowers, such as abnormal disbudded standards with many bracts below the flower (Kofranek and Halevy, 1974), or pompon sprays with long leafy side shoots (Kofrenek, 1992). In the commercial production of chrysanthemum cuttings for the cut flower, homogeneity is required as, uniform & well-grown cuttings offer uniformity in harvesting and flowering (De Greef, 1989 and Hoeven, 1989).

II. MATERIALS AND METHODS

The present study on the effect of types of propagule on cut flower production of chrysanthemum (Dendranthema grandiflora Tzvelev.) were carried out at the experimental farm of Department of Floriculture and Landscape Architecture from January 2014 to December, 2014. The experimental farm is located 1276 m above mean sea level at a latitude of 30° 52' 0" N and longitude 77° 11' 0" E. The climate of the area is typically semi-temperate. The meteorological data were recorded throughout the investigation period with maximum temperature varying from 17.3°C to 28.8°C and minimum from 2.4°C to 19.2°C. The rainfall was maximum in the month of January, 2014 (630 mm) and minimum during October, 2014 (15.7 mm).

The study was conducted on two commercial standard chrysanthemum cultivars, 'Purnima' and 'Yellow Star'. The uniform sized suckers formed in the plants of previous season of Purnima and Yellow Star in the plots of germplasm block of chrysanthemum were separated in the month of March. Some suckers out of this separated material served as planting material for one of the treatment (T_1) and the remaining suckers were planted in the field separately which served as mother block for taking cutting required for further use(20thMarch, 2014). Simultaneously, second type of planting material was prepared using tip cutting taken from suckers of previous year plants which served as another treatment (T_2) after rooting following standard procedure(20th April 2014). The third type of planting material (T_3) was tip cuttings taken from lateral shoots arising on previous year plants and rooted following standard procedure(20th May 2014). Thefourth type of planting material (T_4) was tip cuttings taken from secondary shoots arising from previous year plants(25th June 2014). Fifth type of planting material (T_5) was taken as tip cuttings taken from mother block formed above developed during the year 2014(22nd August 2014). The sixth type of planting material (T_6) was tip cuttings taken from primary shoots of mother block(19th September 2014).The cuttings were propagated using quick dip method by using NAA (500 ppm) in sterile sand in propagation chamber. It was performed 15-25 days after planting, leaving 6 -10 leaves below pinch depending upon the cultivar and time of planting. All other cultural operations remains the same as the standard protocol of crop cultivation.

Field observation were made on plant height(cm), number of side shoots per plant, length of side shoots(cm), plant spread(cm), days taken for visible bud formation(days), days required for peak flowering(days), number of flowers per plant, duration of flowering(days), flower size (cm) and vase life(days). The observations recorded on various growth and flowering parameters were subjected to analysis of variance (ANOVA) using factorial randomized block design (Sheoran etal., 1998).

III. RESULTS AND DISCUSSION

Vegetative characters: It is evident from the Table 1 that vegetative growth of varieties 'Purnima and Yellow star' was markedly influenced by propagule type. Plant height was recorded significantly maximum in cv. Purnima (70.82 cm)followed by Yellow Star (60.16 cm),among different propagule types, T_4 recorded maximum plant height (98.90 cm). It may be due to genetic make and number of days available for under open field condition, also due to availability of different propagule type on mother stock(Suvija et al., 2016). However, interaction was found to be non significant.

Number of side shoots was found to be non significant. As far as propagule type was concerned, T_1(3.31) recorded maximum which was at par with T_4(2.93). This may be due to long day during 1st treatment and woody nature of cutting during short days which promoted less number of side shoots (Cojocariu and Tanase, 2019). The interaction was found to be non significant.Length of side shoots 32.93 cm(Purnima) and 27.76 cm (Yellow Star) was found to be non significant. Variation due to propagule type was also found to be non significant among interaction.

Plant spread of two commercial chrysanthemum cultivars Purnima (20.56 cm) and Yellow Star (19.47 cm) was found to be at par with each other. However, it was found to differ significantly due to different propagules. Among different propagules, maximum plant spread (25.83

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cm) was recorded with T_5 which was at par with T_1 (24.46 cm) and T_4 (23.33 cm). Interaction data showed maximum plant spread 27.78cm (Yellow Star) in T_1 which was at par with T2 (23.43 cm), T5 (25.25 cm) T6 (22.60 cm) in cultivar Purnima and T4 (25.53 cm) and T5 (26.40cm) in cultivar Yellow Star. Increase in plant spread might be due to production of increased number of branches. The similar results were also reported by Mishra (1999) and Kulkarni and Reddy (2004). Differences observed in production of branches among the varieties might be due to inherent genetic factor.

Number of days taken for visible bud formation 108.77 days (Purnima) and 92.76 days (Yellow Star) vary significantly. Among propagule type treatment, T6 (79.67days)which took minimum number of days for visible bud formation was at par with T3 (85.71 days). However, interaction effect was found to be non significant. The variation in days taken to bud formation and flowering of different cultivars can be attributed to their genetic makeup. Similar results have also been reported by Barman et al. (1998), Pathak (2002), Basoli (2009) and Amin et al. (2014).

Flowering characters: Data presented in Table 2 elucidates flowering characters of chrysanthemum cultivars 'Purnima' and 'Yellow star'. Days required for peak flowering showed significant variation from131.56 days (Yellow Star) to 145.98 days (Purnima). In case of propagule types, T_3 (111.67 days) took minimum days for peak flowering which was at par with T_6(113.50 days). Among the interaction, minimum days taken for peak flowering was found to be in T3 (99.00) in cultivar 'Yellow Star'. Early flowering could be due to exposure of plants to short day and low temperature conditions during growth period, which favours flowering in chrysanthemum; as a result, they entered early in to the reproductive phase. Earliness in flowering due to short day condition has been reported by in chrysanthemum (Barman et al.,1998 and Meher et al.,1999).

Number of flowers per plant showed nonsignificant differences betweenvarieties Purnima and Yellow star. As far as the effect of propagules on number of flowers per plant is concerned, maximum number of flowers (2.67) recorded with T_4(tip cutting taken from secondary shoots arising from previous year plant) was found to be at par with T_1 (2.50) (suckers taken from previous year plant) and T_5 (2.33)(tip cutting taken from stock plant). Increase in the number of flowers per plant is due to increase in number of healthy and good quality branches which ultimately enhance the flower production (Vaghasiya etal., 2015). Higher number of flowerproduction might be due to the dominating effect of early planting of propagule and higher number of leaves. Additionally, due to prolonged period of photosynthetic activity, the plants had sufficient food reserves to convert into more flowering buds (Amin et al., 2014).

Duration of flowering varies significantly from 9.89 days (Yellow Star) to 13.54 days (Purnima). Among propagule types on duration of flowering type is concerned, T1 recorded maximum. Interaction showed that maximum flowering duration 22.00 days (Purnima). Kulkarni and Reddy (2008) recordedthatlate planted cultivar had less number of branches and leaf area which ultimately resulted in lesser duration of flowering. These variations have the commercial advantages for selecting cultivar to have continuity for flower supply for longer period which will help in earning better returns (Madam et al., 2016).

For flower size, cultivars varied non significantly, as far as effect of propagule type was concerned, maximum flower size was obtained in T_4 (11.28 cm). Flower size also varied significantly due to the interaction between propagule type and cultivar. Largest flowers were recorded in cv. Purnima (13.24 cm) with propagule T_5which was found to be at par with T_4 and T_1 in both cultivars 'Purnima' (8.56 cm and 8.78 cm, respectively) and 'Yellow Star' (13.10 cm and 12.89 cm, respectively). This may be due to a greater number of short days for flower bud formation in open condition.

Significantly higher vase life of 14.92 days was recorded in cv. Purnima than Yellow Star (11.89 days). Effect of propagule types on vase life is concerned, maximum vase life 17.17 days recorded in T_1which was at par with T_4(16.50 days). The interaction data presented in the Table 2 revealed that the maximum vase life (19.33 days) was recorded in cv. Purnima treatment T_1 which was at par with T_2 (18.00 days) and T4 (17.00 days). Another possibility of lesser vase life of these flowers may be because in earlier planted crops, the cut stems were of woody nature which might have reduced the water uptake from the vases (Basoli, 2009) and due to stomatal closure (Fanourakiset al., 2021).

IV. CONCLUSION

Although planting of suckers for cut flower production is generally used by farmers in

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Himachal Pradesh, but shoot tip cutting can be better option for commercial propagation of chrysanthemum. Based upon the findings, it can be concluded that three successive shoot tip cuttings at one month interval found best for chrysanthemum cut flower production. Out of two cultivars, cv. Purnima performed better than cv. Yellow Star.

Table 1. Effect of propagule on vegetative characters of chrysanthemum cultivars Purnima and Yellow Star

TREATMENT	PLANT HEIGHT (CM)			NUMBER OF SIDE SHOOTS PER PLANT			LENGTH OF SIDE SHOOTS (CM)			PLANT SPREAD (CM)			NUMBER OF DAYS TAKEN FOR VISIBLE BUD FORMATION		
	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean
T1	96.48	62.81	79.65	3.34	3.29	3.31	28.97	19.74	24.36	21.14	27.78	24.46	130.33	118.33	124.33
T2	84.80	69.39	77.10	2.76	2.62	2.69	33.02	26.92	29.97	23.43	11.08	17.26	113.33	83.33	98.33
T3	35.42	27.39	31.41	1.00	1.00	1.00	35.42	27.39	31.40	9.80	11.37	10.58	87.33	83.00	85.17
T4	98.74	99.06	98.90	2.77	3.08	2.93	35.71	32.32	34.01	21.14	25.53	23.33	127.33	103.33	115.33
T5	76.30	74.46	75.38	2.46	2.46	2.46	31.29	32.38	31.83	25.25	26.40	25.83	116.27	87.23	101.75
T6	33.17	27.82	30.50	1.00	1.00	1.00	33.17	27.82	30.49	22.60	14.67	18.63	78.00	81.33	79.67
MEAN	70.82	60.16	-	2.22	2.24	-	32.93	27.76	-	20.56	19.47	-	108.77	92.76	-
$CD_{0.05}$															
CULTIVARS			9.16			NS			NS			NS			8.05
PROPAGULE TYPES			15.87			0.45			NS			4.37			13.96
PROPAGULE TYPES X CULTIVARS			NS			NS			NS			6.19			NS

T_1: Suckers taken from previous year plant
T_2:Tip cutting taken from suckers of previous year plant
T_3: Tip cutting taken from lateral shoots arising from previous year plant
T_4:Tip cutting taken from secondary shoots arising from previous year plant
T_5:Tip cutting taken from stock plant
T_6:Tip cutting taken from primary shoot of stock plant

Table 2. Effect of propagule on flowering characters of chrysanthemum cultivars Purnima and Yellow Star

TREATMENT	DAYS TAKEN FOR PEAK FLOWERING			NUMBER OF FLOWERS PER PLANT			DURATION OF FLOWERING (DAYS)			FLOWER SIZE (CM)			VASE LIFE (DAYS)		
	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean	Purnima	Yellow Star	Mean
T1	173.33	162.00	167.67	2.33	2.67	2.50	22.00	12.33	17.17	8.78	12.89	10.84	19.33	15.00	17.17
T2	144.33	134.67	139.50	2.67	1.33	2.00	17.00	11.00	14.00	7.87	4.86	6.37	18.00	9.00	13.50
T3	124.33	99.00	111.67	1.00	1.00	1.00	7.60	7.67	7.63	4.43	5.60	5.01	9.00	11.00	10.00
T4	171.67	155.00	163.33	2.67	2.67	2.67	13.67	13.00	13.33	8.56	13.10	11.28	17.00	16.00	16.50
T5	147.20	126.67	136.93	2.33	2.33	2.33	14.00	8.33	11.17	13.24	5.69	9.47	16.17	9.00	12.58
T6	115.00	112.00	113.50	1.33	1.00	1.17	7.00	7.00	7.00	5.83	5.53	5.68	10.00	11.33	10.67
MEAN	145.98	131.56	-	2.06	1.83	-	13.54	9.89	-	8.12	8.10	-	14.92	11.89	-
$CD_{0.05}$															
CULTIVARS			2.44			NS			1.20			NS			1.04
PROPAGULE TYPES			4.23			0.59			2.07			3.35			1.80
PROPAGULE TYPES X CULTIVARS			5.98			NS			2.93			4.74			2.54

T_1: Suckers taken from previous year plant
T_2:Tip cutting taken from suckers of previous year plant
T_3: Tip cutting taken from lateral shoots arising from previous year plant
T_4:Tip cutting taken from secondary shoots arising from previous year plant
T_5:Tip cutting taken from stock plant
T_6:Tip cutting taken from primary shoot of stock plant

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