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## Effect of planting time and pinching on flower quality of annual chrysanthemum

RA Hawa, SU Gondane and DM Panchbhai

**Abstract**

The field experiment was carried out at Horticulture section, Rural Institute, Pipri-Wardha (Maharashtra), India; with objective to find out effect of planting time and pinching on flower quality of Annual Chrysanthemum. Treatments comprising five planting times viz. 15<sup>th</sup> September, 1<sup>st</sup> October, 15<sup>th</sup> October, 1<sup>st</sup> November and 15<sup>th</sup> November and four pinching treatments viz. No pinching, pinching at 30 DAT, pinching at 45 DAT and pinching at 30 and 45 DAT during the year 2010-11 and 2011-12. Among the planting times, 15<sup>th</sup> October planting resulted in significantly maximum weight of flower, diameter of fully opened flower, diameter of flower disc, length of pedicel, longevity of intact flower and vase life. Single pinching at 30 days after transplanting improved weight of flower, diameter of fully opened flower, diameter of flower disc and longevity of intact flower, whereas more length of pedicel was registered in no pinching. Double pinching 30 and 45 days after transplanting registered more vase life.

**Keywords:** Annual chrysanthemum, planting time, pinching, transplanting

**Introduction**

Chrysanthemum is a member of family Asteraceae. Annual chrysanthemum comprise of three species viz., *Chrysanthemum segtum* (corn marigold), *Chrysanthemum carinatum* (tricoloured chrysanthemum) and *Chrysanthemum coronarium* (crown daisy or garland chrysanthemum). The crown daisy or garland chrysanthemum is a native to Southern Europe, is a branching annual with a finely cut foliage reaching a height up to a meter, size of flowers varies from 2.2 to 4 cm and colour is usually in shades yellow and white with cream zone at the center (Vishnu Swarup, 1967) [1].

The growers are attracted towards annual chrysanthemum flowers as its of short duration, to produce marketable attractive good keeping quality flowers. Annual chrysanthemum is generally tall growing, with a view to get a dwarf bushy plant and for getting quality flowers, experiment was conducted on "Effect of planting time and pinching on quality of annual chrysanthemum".

**Materials and methods**

The field experiment was conducted at Horticulture Section, Rural Institute, Pipri, Wardha during the years 2010-11 and 2011-12. The experiment was laid out in factorial randomized block design with 20 treatment combinations and three replications. The treatment comprised two factors, factor A comprised with five planting times viz., 15<sup>th</sup> September (T<sub>0</sub>), 1<sup>st</sup> October (T<sub>1</sub>), 15<sup>th</sup> October (T<sub>2</sub>), 1<sup>st</sup> November (T<sub>3</sub>), and 15<sup>th</sup> November (T<sub>4</sub>). Factor B comprised four pinching treatments viz., No pinching (P<sub>0</sub>), pinching at 30 DAT (P<sub>1</sub>), pinching at 45 DAT (P<sub>2</sub>) and pinching at 30 and 45 DAT (P<sub>3</sub>). Local seeds of annual chrysanthemum were sown on raised nursery beds. Thirty five days healthy and uniform seedlings were transplanted in prepared flat beds on five different dates at a spacing of 45x30 cm. All recommended cultural operations were followed during crop growth. Pinching operations were done as per treatments. Observation on quality parameters were recorded and collected data was statistically analysed as per Gomez and Gomez (1984) [4].

**Results and Discussion**

The results obtained from the present investigation as well as relevant discussion regarding the flower quality have been summarized under the following heads.

**Effect of planting time and pinching on weight of flower and diameter of fully opened flower:** It is evident from presented findings (Table-1) that significant differences were recorded in weight of flower and diameter of fully opened flower among the different planting time and pinching treatments during both the years of experimentation.

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**Effect of planting time on weight of flower:** Significantly maximum weight of flower was observed in 15<sup>th</sup> October planting (2.188, 2.171 and 2.179 g) whereas, minimum weight of flower was observed in 15<sup>th</sup> November planting (2.072, 2.053 and 2.062 g) during the years 2010-11, 2011-12 and pooled result respectively. This might be due to the result

of increased photosynthetic activity proportionately to better vegetative growth with 15<sup>th</sup> October planting to develop better size and weight of flowers on the plant. These results are in line with the findings of Badge (2009) <sup>[1]</sup> in gladiolus and Pakhale (2011) <sup>[7]</sup> in African marigold.

**Table 1:** Weight of flower and diameter of fully opened flower as influenced by planting time and pinching

Treatment	Weight of flower (g)		Pooled	Diameter of fully opened flower (cm)		Pooled
	2010-11	2011-12		2010-11	2011-12	
<b>Planting time (T)</b>						
T <sub>0</sub> – 15 <sup>th</sup> September	2.097	2.075	2.086	5.765	5.443	5.604
T <sub>1</sub> – 1 <sup>st</sup> October	2.160	2.138	2.149	6.172	5.657	5.914
T <sub>2</sub> – 15 <sup>th</sup> October	2.188	2.171	2.179	6.240	5.857	6.048
T <sub>3</sub> – 1 <sup>st</sup> November	2.123	2.105	2.114	6.070	5.552	5.811
T <sub>4</sub> – 15 <sup>th</sup> November	2.072	2.053	2.062	5.713	5.377	5.545
F test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.024	0.024	0.019	0.085	0.073	0.060
C.D. at 5%	0.068	0.069	0.053	0.243	0.208	0.169
<b>Pinching (P)</b>						
P <sub>0</sub> – No pinching	1.939	1.921	1.930	5.616	5.223	5.419
P <sub>1</sub> – 30 DAT	2.336	2.315	2.326	6.368	5.965	6.167
P <sub>2</sub> – 45 DAT	2.137	2.116	2.126	6.019	5.599	5.809
P <sub>3</sub> – 30&45 DAT	2.099	2.081	2.090	5.965	5.521	5.743
F test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.021	0.021	0.017	0.076	0.065	0.054
C.D. at 5%	0.060	0.062	0.048	0.218	0.186	0.152
<b>Interaction (TxP)</b>						
F test	NS	NS	NS	NS	NS	NS
SE (m) ±	0.047	0.048	--	0.170	0.146	--
C.D. at 5%	--	--	--	--	--	--

**Effect of pinching weight of flower:** Maximum weight of flower was observed in single pinching at 30 days after transplanting (2.336, 2.315 and 2.326 g). Whereas, minimum weight of flower was recorded in control i.e. no pinching (1.939, 1.921 and 1.930 g) during the years 2010-11, 2011-12 and pooled result respectively. An early pinched plant i.e. 30 days after transplanting produced more weight of flowers. This was due to superior growth obtained in pinched plants were responsible for the production of flowers of better size and consequently more weight of flowers in early pinching. These results are corroborated by the results of Shivankar (2010) <sup>[9]</sup> in annual chrysanthemum.

**Effect of planting time on the diameter of fully opened flower:** Significantly maximum diameter of flower was noticed in 15<sup>th</sup> October planting (6.240, 5.857 and 6.048 cm) whereas, minimum diameter of fully opened flower was observed in 15<sup>th</sup> November planting (5.713, 5.377 and 5.545 cm) during the years 2010-11, 2011-12 and pooled result respectively. The attractive larger size flowers were harvested from 15<sup>th</sup> October planting, owing to the fact that the flowering altered by periodic effect of light and dark interaction as evident during the period of couple of years investigation. These results are in close agreement with the findings of Sreekanth *et al.* (2006) <sup>[10]</sup> and Pakhale (2011) <sup>[7]</sup> in African marigold.

**Effect of pinching on the diameter of fully opened flower:** Maximum diameter of fully opened flower was noticed in single pinching at 30 days after transplanting (6.368, 5.965 and 6.167 cm). Whereas, minimum diameter of fully opened

flower was registered in control i.e. no pinching (5.616, 5.223 and 5.419 cm) during the years 2010-11, 2011-12 and pooled result respectively. Significantly larger size diameter of fully opened flowers was observed in pinching at 30 days after transplanting was due to a single pinching at earlier stage induced vigorous branching and leaves which favoured to develop larger flowers. These results are in close conformity with the results of Hendriks and Lemper (1983) <sup>[5]</sup> in chrysanthemum and in confirmation with Shivankar (2010) <sup>[9]</sup> in annual chrysanthemum.

**Effect of planting time and pinching on diameter of flower disc and length of pedicel:** Diameter of flower disc and length of pedicel was significantly influenced by the different planting time and pinching (Table-2) during both the years of experimentation.

**Effect of planting time on diameter of flower disc:** During both the years of experimentation, significantly maximum diameter of flower disc was recorded in 15<sup>th</sup> October planting (2.170 and 2.083 cm) whereas, minimum diameter of flower disc was noticed in 15<sup>th</sup> November planting (1.940 and 1.845 cm), during the year 2010-11 and 2011-12 respectively. In this study the diameter of flower disc ranged from 1.845 to 2.170 cm these results are in close agreement with the findings of Badge (2009) <sup>[1]</sup> in gladiolus, Sreekanth *et al.* (2006) <sup>[10]</sup> and Pakhale (2011) <sup>[7]</sup> in African marigold.

**Effect of pinching on diameter of flower disc:** During both the years of experimentation, maximum diameter of flower disc was recorded in single pinching at 30 days after

transplanting (2.125 and 2.048). Whereas, minimum diameter of flower disc was noticed in control i.e. no pinching (1.977 and 1.891 cm), during the year 2010-11 and 2011-12 respectively. From the above results, the maximum diameter of flower disc might be the reflection of larger size diameter of fully opened flowers in pinching at 30 days after transplanting. Similar results were also observed by Shivankar (2010) [9] in annual chrysanthemum.

**Effect of planting time on length of pedicel:** During both the years of investigation, significantly maximum length of pedicel was observed in 15<sup>th</sup> October planting (10.16 and 9.25 cm) whereas, minimum length of pedicel was registered in 15<sup>th</sup> November planting (9.17 and 8.13 cm), during the year 2010-11 and 2011-12 respectively. Appearance of flower growth is the development of pedicel apparently dominated by stimuli produced in the flowering bud. From the pedicel, growth rate appears to reflect the production of growth

substances. These results are quite similar to the findings of Pakhale (2011) [7] in African marigold.

**Effect of pinching on length of pedicel:** During both the years of investigation, significantly maximum length of pedicel was recorded in control i.e. no pinching (10.17 and 9.18 cm). Whereas, significantly minimum length of pedicel was noticed in double pinching at 30 and 45 days after transplanting (8.92 and 7.92 cm), during the year 2010-11 and 2011-12 respectively.

Unpinched plants continued the longitudinal growth of pedicel resulted to long flower stalk. But in pinching, reduced flower stalk length is due to consequence depression of gibberellins synthesis. These results are in close agreement with the findings of Bholane (1998) [2] in chrysanthemum, Kumar and Singh (2003) [6] in carnation and in conformity with the findings of Shivankar (2010) [9] in annual chrysanthemum.

**Table 2:** Diameter of flower disc and length of pedicel as influenced by planting time and pinching.

Treatment	Diameter of flower disc (cm)		Length of pedicel (cm)	
	2010-11	2011-12	2010-11	2011-12
<b>Planting time (T)</b>				
T <sub>0</sub> – 15 <sup>th</sup> September	1.952	1.872	9.19	8.19
T <sub>1</sub> – 1 <sup>st</sup> October	2.100	2.005	10.08	9.06
T <sub>2</sub> – 15 <sup>th</sup> October	2.170	2.083	10.16	9.25
T <sub>3</sub> – 1 <sup>st</sup> November	1.998	1.940	10.01	8.99
T <sub>4</sub> – 15 <sup>th</sup> November	1.940	1.845	9.17	8.13
F test	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.034	0.039	0.19	0.23
C.D. at 5%	0.096	0.113	0.55	0.66
<b>Pinching (P)</b>				
P <sub>0</sub> – No pinching	1.977	1.891	10.17	9.18
P <sub>1</sub> – 30 DAT	2.125	2.048	9.95	8.96
P <sub>2</sub> – 45 DAT	2.027	1.945	9.85	8.85
P <sub>3</sub> – 30 & 45 DAT	1.999	1.912	8.92	7.92
F test	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.030	0.035	0.17	0.21
C.D. at 5%	0.086	0.101	0.49	0.59
<b>Interaction (TxP)</b>				
F test	NS	NS	NS	NS
SE (m) ±	0.067	0.079	0.38	0.46
C.D. at 5%	--	--	--	--

**Effect of planting time and pinching on longevity of intact flower and vase life of flower:** Longevity of intact flower and vase life of flower was significantly influenced by the different planting time and pinching (Table-3) during both the years of investigation.

**Effect of planting time on longevity of intact flower:** During both the years of study, significantly maximum longevity of intact flower was noticed in 15<sup>th</sup> October planting (11.33 and 10.63 days) whereas, minimum longevity of intact flower was recorded in 15<sup>th</sup> November planting (10.30 and 9.60 days),

during the year 2010-11 and 2011-12 respectively. The flowering state involves coordination of several rhythmic processes in the meristem. Temperature experiences ability to stimulate flowering. Therefore blooming of annual chrysanthemum plant on 15<sup>th</sup> October remained more attractive in field condition as it expose to the favourable cooler temperature, short day length and low sunshine. Due to the megre transpiration, the intact flower in the field did not weather. Hence the longevity of flower is more in 15<sup>th</sup> October planting. These results are in close agreement with the findings of Pakhale (2011) [7] in African marigold.

**Table 3:** Longevity of intact flower and vase life of flower as influenced by planting time and pinching.

Treatment	Longevity of intact flower (days)		Vase life of flower (days)	
	2010-11	2011-12	2010-11	2011-12
<b>Planting time (T)</b>				
T <sub>0</sub> – 15 <sup>th</sup> September	10.75	9.95	5.35	4.75
T <sub>1</sub> – 1 <sup>st</sup> October	11.12	10.38	5.52	4.97
T <sub>2</sub> – 15 <sup>th</sup> October	11.33	10.63	5.58	5.07
T <sub>3</sub> – 1 <sup>st</sup> November	10.95	10.27	5.42	4.82
T <sub>4</sub> – 15 <sup>th</sup> November	10.30	9.60	4.82	4.20
F test	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.17	0.23	0.07	0.08
C.D. at 5%	0.49	0.67	0.21	0.24
<b>Pinching (P)</b>				
P <sub>0</sub> – No pinching	9.91	9.21	5.16	4.59
P <sub>1</sub> – 30 DAT	11.77	11.17	5.40	4.84
P <sub>2</sub> – 45 DAT	10.88	10.05	5.31	4.71
P <sub>3</sub> – 30 & 45 DAT	11.00	10.23	5.48	4.91
F test	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.15	0.21	0.07	0.07
C.D. at 5%	0.43	0.60	0.19	0.21
<b>Interaction (TxP)</b>				
F test	NS	NS	NS	NS
SE (m) ±	0.34	0.47	0.15	0.17
C.D. at 5%	--	--	--	--

**Effect of pinching longevity of intact flower:** During both the years of study, maximum longevity of intact flower was registered in single pinching at 30 days after transplanting (11.77 and 11.17 days). Whereas, minimum longevity of intact flower was noticed in control i.e. no pinching (9.91 and 9.21 days), during the year 2010-11 and 2011-12 respectively. Significantly maximum longevity of intact flower was achieved in the treatment of single pinching at 30 days after transplanting; pinching was performed at earlier stage so there was more accumulation of carbohydrates in flower. Similar results have been reported by Shivankar (2010) [9] in annual chrysanthemum.

**Effect of planting time on vase life of flower:** During both the years of investigation, significantly more vase life was recorded in 15<sup>th</sup> October planting (5.58 and 5.07 days) whereas, the minimum vase life was observed in 15<sup>th</sup> November planting (4.82 and 4.20 days), during the year 2010-11 and 2011-12 respectively. Floral indoor decoration and cut flower in any function is a need of the hour. The freshness with all the attractive norms must possess in the flower. The various organs of flower should be as fresh as in the field. Therefore the flowers of annual chrysanthemum were tested for their vase life at normal room temperature. It was found that flowers of 15<sup>th</sup> October planting may be kept in vase for longer period (5.58 days). The size of pedicel full of stored food material maintained firmness for long as evident in of annual chrysanthemum. These results are corroborated by the results of Gajbhiye (1999) [3] in gladiolus and in close agreement with the findings of Pakhale (2011) [7] in African marigold.

**Effect of pinching vase life of flower:** During both the years of experimentation, double pinching at 30 and 45 days after transplanting (5.48 and 4.91 days) recorded significantly maximum vase life. Whereas, minimum vase life of flower was noticed in control i.e. no pinching (5.16 and 4.59 days), during the year 2010-11 and 2011-12 respectively. Variation in vase life could be attributed to the fact that the variation in ability to produce ethylene and sensitivity to it among different pinching treatments as evident in double pinching at

30 and 45 DAT. These results are agreed with the findings of Ryagi *et al.* (2007) [8] who noticed maximum vase life in double pinching (8.21 days) in carnation.

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