

## EFFECT OF PINCHING AND CYCOCEL ON FLOWERING AND FLOWER QUALITY OF ANNUAL CHRYSANTHEMUM

Shrutika Taksande<sup>-1</sup>, V. U. Raut<sup>-2</sup> and P. K. Nagre<sup>-3</sup>

### ABSTRACT

The present experiment was carried out to study the effect of pinching and cycocel on seed yield of Annual Chrysanthemum at Department of Horticulture, Dr. PDKV, Akola. Experiment comprising four levels of pinching i.e. no pinching, pinching at 15 DAT, pinching at 30 DAT and pinching at 45 DAT and four levels of cycocel i.e. 500 ppm, 1000 ppm, 1500 ppm and water spray (control) during *rabi* season of the year 2013-14 and 2014-15. Among the pinching treatments, significantly more days to first flower bud initiation, opening of flower from bud initiation, days to 50 % flowering and blooming period was recorded in the treatment pinching at 45 DAT whereas, pinching at 15 DAT was found to be best for diameter of fully opened flower and more length of flower stalk was found in no pinching. In respect of foliar application of cycocel, cycocel @ 1500 ppm was recorded significantly more days to first flower bud initiation, opening of flower from bud initiation, days to 50 % flowering and blooming period. Significantly maximum diameter of fully opened flower was recorded in 1000 ppm of cycocel and more length of flower stalk was found in control.

(Key words: Pinching, cycocel, flowering, foliar application)

### INTRODUCTION

It grows very well under mild or slightly cold climate, but will grow quickly into premature flowering in warm summer conditions. It produces large sized attractive blooms for making garlands and for decoration during religious functions. As a cut flower, it makes a bold arrangement due to the availability of long stems (Desai, 1962). The plant is fast growing and used as a background to a broad flower border. Flowers are edible; usually petals are used, fresh or dried, as a garnish or to brew a tea. An annual chrysanthemum flower is usually a versatile flower, because these flowers have different shape, size, number of petals, length of pedicel and vase life. For production of economical yield of annual chrysanthemum flowers, it is necessary to adopt a proper agro-technique by applying new cultural practices like pinching and growth retardants like cycocel.

Pinching refers to removal of growing tips of the plants to induce the growth of vegetative laterals. Due to pinching, number of branches and flowering stem may increase in each plant and more yield of flowers and seeds unit<sup>-1</sup> area can be obtained. Cycocel is an important growth retardant useful in most of the plant. Growth retardants are also useful to arrest vertical growth as it acts antagonistically to auxin and thus, counteracts apical dominance and hence, it may be also useful in increasing number of branches plant<sup>-1</sup>. It is generally accepted that exogenously applied growth substances act through the alteration in the levels of naturally occurring hormones, thus, modifying the growth

and development of the plant. Hence, the present study was undertaken to study the effect of pinching and cycocel on flowering and flower quality of annual chrysanthemum.

### MATERIALS AND METHODS

An experiment entitled, "Effect of pinching and cycocel on seed yield of annual chrysanthemum" was conducted at Department of Horticulture, Dr. PDKV, Akola during *rabi* season of the year 2013-14 and 2014-15. Experiment was laid out in FRBD with three replications and sixteen treatments combinations. Experiment comprising four levels of pinching i.e. P<sub>1</sub> - no pinching, P<sub>2</sub> - pinching at 15 DAT, P<sub>3</sub> - pinching at 30 DAT and P<sub>4</sub> - pinching at 45 DAT and four levels of cycocel i.e. T<sub>1</sub> - 500 ppm, T<sub>2</sub> - 1000 ppm, T<sub>3</sub> - 1500 ppm and T<sub>4</sub> - water spray (control). Seeds of annual chrysanthemum were sown in the nursery. Farm yard manure was applied at 20 t ha<sup>-1</sup>. A standard dose of NPK at the rate of 100 kg N, 50 kg P and 50 kg K hectare<sup>-1</sup> was applied. Full dose of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O along with half dose of N was applied at the time of transplanting and remaining half dose of nitrogen was given at 30 DAT. The uniform and healthy seedlings were selected for the transplanting and one day prior to transplanting irrigation was given to the prepared plot. Seedling transplanted by keeping 30 cm distances between plants and 30 cm between rows

Regarding pinching treatment 4-5 cm terminal portion of growing tip was nipped out as per treatment time i. e. 15, 30 and 45 DAT. Application of cycocel was done at 40 DAT. Observations on flowering (days to first flower bud initiation, opening of flower from bud initiation, days

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1. Ph.D. Students, Horticulture Section, Dr. PDKV, Akola
  2. Assoc. Professor, Horticulture Section, College of Agriculture, Nagpur
  3. Professor and Head, Deptt. of Horticulture, Dr. PDKV, Akola

to 50 % flowering and blooming period and flower quality (diameter of fully opened flower and length of flower with pedicel) were recorded. The data were statistically analyzed as per method suggested by Gomez and Gomez (1984) for randomized block design.

## RESULTS AND DISCUSSION

The results obtained from present investigation are presented below on the basis of pooled mean of two years of experimentation (2013-2014 and 2014-2015).

### Effect of pinching

#### Flowering parameters

The flowering parameters included days to first flower bud initiation, opening of flower from bud initiation, days to 50 % flowering and blooming period. The observations recorded on flowering parameters are given in table 1. The data revealed significant differences among the treatments in respect of days required for first flower bud emergence. Significantly maximum days to first flower bud emergence was recorded in pinching at 45 days after transplanting (53.05 days) which was significantly superior over rest of the treatments. Whereas, minimum days to first flower bud initiation was registered in control treatment i.e. no pinching (43.39 days). The delay in flowering by pinching might be due to removal of matured portion and new shoots which emerged out from pinched plants, took more time to become physiologically inductive to produce flowers than non pinched plant. Shrivastava *et al.* (2002) reported that, the pinching at 40 days after transplanting increased the number of days required for initiation of flower bud and duration of flowering in marigold cv. 'Pusa Narangi Gaiinda'. Shinde (2010) observed that non pinch plant took minimum number of days for initiation of first flower bud as compared to pinched plant in chrysanthemum cv. IIHR-6 under Anand, Gujarat condition.

The data revealed significant differences among the treatments, in respect of days to opening of flower bud from bud emergence, 50% flowering and blooming period. Significantly maximum days to fully opened flower from bud emergence, 50% flowering and blooming period was recorded in pinching at 45 days after transplanting (21.65 days, 71.07 days and 45.83 days) which was significantly superior over rest of the treatments whereas minimum days to fully opened flower from bud emergence 50% flowering and blooming period was registered in control treatment i.e. no pinching (15.40 days, 59.57 days and 34.04 days). Pinching delayed fully opened flowers from bud initiation. Generally around 15 days are needed for full opening of flower. Differentiation of flower primordial in the meristem occurs when rapid vegetative stem growth has ended. One more week period is extended for fully developed flower in pinching because of the fact that plants take more time to shift active vegetative phase to flowering stage. Pinching delayed flowering. Response of pinching delays reproductive phase. The food material accumulated is not available for flowering

as it is diverted more for the lateral vegetative growth especially for developing branches. Pinching require one and half months period from induction to flower initiation might be due to the shoot tip pinching, that increased the number of primary branches and leaves plant<sup>-1</sup> which helps to maximize duration of flowering than control, whereas annual chrysanthemum grown without pinching was ready within a month. Maharnor *et al.* (2011) quoted less number of days required for 50% flowering in no pinching in African marigold cv. African Double Orange under Nagpur condition during *rabi* season. Sharma *et al.* (2012) stated that, less number of days required for 50% flowering was recorded in no pinching as compared to pinching at 20DAT, 30 DAT and 40 DAT in African marigold and also observed that the late pinching 40 DAT recorded maximum blooming period compared to early pinching in African marigold.

#### Flower Quality

The observations recorded on flower quality parameters are given in table 2. Significant differences were recorded among the treatments in respect of diameter of fully opened flower. Significantly maximum diameter of fully opened flower was noted in pinching at 15 days after transplanting (6.14 cm) followed by pinching at 30 DAT (5.14 cm). Whereas minimum diameter of fully opened flower was registered in control treatment i.e. no pinching (4.61 cm). Pinching increased the diameter of flower. Significantly larger size diameter of fully opened flowers was observed in pinching at 15 days after transplanting; Pinching at earlier stage induced vigorous branching and leaves which favored to develop larger flowers. Pawar (2001) reported that, the flower quality was better when plants pinched once at 4 weeks in chrysanthemum cv. 'PKV Shubhra'. Shivankar (2010) conducted an experiment on annual chrysanthemum and reported that, pinching at 30 days after transplanting achieved the maximum weight of flower, diameter of fully opened flower, diameter of flower disc and longevity of intact flower.

The data revealed significant differences among the treatments in respect of length of flower with pedicel. Significant maximum length of flower with pedicel was observed in no pinching (9.42 cm) followed by pinching at 15 DAT (8.87 cm), whereas minimum diameter of fully opened flower was registered in pinching at 45 DAT (8.35 cm). 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. Rakesh (2004) obtained significantly longer stalk length of flower in non pinched plant as compared to pinched plant in chrysanthemum cv. Flirt and Guari. Shivankar (2010) observed that, maximum length of pedicel was recorded in control treatment i.e. no pinching, and maximum vase life of flower was noticed in double pinching at 30 and 45 days after transplanting. Maharnor (2011) observed maximum stalk length of flower in control i.e. no pinched plant as compared to pinched plant in African marigold cv. Double Orange Genda.

## Effect of cycocel

### Flowering parameters

The flowering parameters included days to first flower bud initiation, opening of flower from bud initiation, days to 50 % flowering and blooming period. The observations recorded on flowering parameters are given in table 1.

The data revealed significant differences among the treatments in respect of days required for first flower bud emergence, days to opening of flower bud from bud emergence, 50% flowering and blooming period. Significant maximum days to first flower bud emergence was noticed in cycocel @ 1500 ppm (50.86 days, 20.90 days, 69.49 days and 43.28 days) respectively which was significantly superior over rest of the treatments, whereas minimum days to first flower bud emergence, days to opening of flower bud from bud emergence, 50% flowering and blooming period were registered in control (45.96 days, 15.51 days, 61.67 days and 38.00 days) respectively. Cycocel delayed the flowering. Cycocel being a growth retardant inhibited the endogenous synthesis of gibberellins responsible for flower bud initiation and hence, delayed flowering. Cycocel delayed the flower opening after bud emergence was due to their growth retarding action might have inhibited the endogenous synthesis of gibberellins resulted in delayed opening of flower buds. Maximum delayed 50 % flowering might be due to reduction in the flower bud development and inhibition of GA biosynthesis by cycocel. Maximum blooming period observed in treatment of 1500 ppm cycocel, it might be due to availability of more photosynthesis for the longer period so as to prolong reproductive phase and increase in weight and diameter of flower. Khandelwal *et al.* (2003) conducted an experiment on African marigold and reported that, foliar application of cycocel at 3000 ppm delayed first flower initiation (49.02 days) and increased duration of flowering (54.93 days). Shivankar (2010) found that, maximum days to 50% flowering, days to first harvesting observed in CCC 2000 ppm as compared to control in annual chrysanthemum. Korde (2012) noticed that, foliar application of cycocel 1000 ppm recorded maximum flowering span in

annual chrysanthemum. Shrikant *et al.* (2013) reported foliar spraying of cycocel at 2000 ppm was suggested for extending duration of flowering in China aster.

### Flower Quality

The observations recorded on flowering parameters are given in table 2. The data revealed significant differences among the treatments in respect of diameter of fully opened flower. Significant maximum diameter of fully opened flower noticed in cycocel @ 1000 ppm (5.44 cm) which was significantly superior over rest of the treatments, whereas minimum diameter of fully opened flower was registered in control (4.88 cm). The larger diameter in cycocel treatment was due to its effect lead to decrease in cell size, internodal length, with a promotive activity on side shoots to sprout. Pawar (2007) recorded significant increase in diameter of flower, highest diameter and yield of flower hectare<sup>-1</sup> with the application of cycocel at 750, 1000 and 1250 ppm, respectively. They further reported that, 1000 ppm was significantly superior over all the treatments in gaillardia. Shrikant *et al.* (2013) observed maximum weight of flower and diameter of fully open flower in CCC of concentration 1000 ppm as compared to CCC 2000 ppm and 1500 ppm concentration in annual chrysanthemum. Korde (2012) recorded maximum flower diameter (2.50 cm), flower disk diameter (5.92 cm) and weight of flowers plant<sup>-1</sup> (2.34 g) in the treatment cycocel 1000 ppm in annual chrysanthemum.

The data revealed that there were significant differences among the treatments in respect of length of flower with pedicel. Significantly maximum length of flower with pedicel was noticed in control (9.19 cm). Whereas, minimum length of flower with pedicel was registered in the treatment of cycocel @ 500 ppm (8.55 cm). Role of cycocel to restrain the growth of stem and leaves without affecting the development of reproductive organs. This might be the reason for minimum length of flower with pedicel in the present investigation. Korde (2012) observed maximum stalk length and vase life in control and cycocel 1500 ppm respectively in annual chrysanthemum.

Table 1. Flowering parameters of annual chrysanthemum as influenced by pinching and cycocel

Treatments	Days required for first flower bud emergence (days)				Days to fully opened flower from bud emergence (days)				Days to 50% flowering from transplanting (days)				Blooming period (days)			
	2013-2014	2014-2015	Pooled Mean		2013-2014	2014-2015	Pooled Mean		2013-2014	2014-2015	Pooled Mean		2013-2014	2014-2015	Pooled Mean	
<b>Factor A. Pinching (P)</b>																
P <sub>1</sub> – No pinching	42.77	49.29	43.39		15.37	15.70	15.40		59.49	60.11	59.57		33.57	34.32	34.04	
P <sub>2</sub> – 15 DAT	48.49	50.39	48.89		16.78	17.15	16.94		64.98	65.58	65.28		40.19	40.92	40.55	
P <sub>3</sub> – 30 DAT	49.84	50.61	50.22		19.15	19.48	19.31		66.51	67.04	66.78		42.66	43.35	43.01	
P <sub>4</sub> – 45 DAT	52.72	59.33	53.05		21.44	21.86	21.65		70.76	71.40	71.07		45.80	46.18	45.83	
SE(m) ±	0.52	0.51	0.41		0.25	0.24	0.23		0.34	0.32	0.35		0.22	0.24	0.21	
C D at 5 %	1.51	1.47	1.20		0.72	0.70	0.68		0.98	0.94	1.01		0.65	0.69	0.61	
<b>Factor B. Cycocel (T)</b>																
T <sub>1</sub> – 500ppm	47.60	50.10	47.93		17.61	18.03	17.70		64.32	64.92	64.39		39.86	40.54	40.30	
T <sub>2</sub> – 1000ppm	49.46	51.37	49.66		19.02	19.36	19.19		66.87	67.43	67.14		41.42	42.28	41.85	
T <sub>3</sub> – 1500ppm	50.86	53.53	51.14		20.74	21.07	20.90		69.19	69.79	69.49		42.94	43.64	43.28	
T <sub>4</sub> – Water spray	45.96	48.61	46.82		15.35	15.68	15.51		61.36	61.99	61.67		37.68	38.31	38.00	
SE(m) ±	0.52	0.51	0.41		0.25	0.24	0.23		0.34	0.32	0.35		0.22	0.24	0.21	
C D at 5 %	1.51	1.47	1.20		0.72	0.70	0.68		0.98	0.94	1.01		0.65	0.69	0.61	
<b>C. Interaction (PxT)</b>																
SE(m) ±	1.05	1.02	0.83		0.48	0.47	0.47		0.67	0.65	0.69		0.44	0.44	0.42	
C D at 5 %	--	--	--		--	--	--		--	--	--		--	--	--	

**Table 2. Flower quality of annual chrysanthemum as influenced by pinching and cycocel**

Treatments	Diameter of fully opened flower (cm)			Length of flower with pedicel (cm)		
	2013-2014	2014-2015	Pooled Mean	2013-2014	2014-2015	Pooled Mean
<b>A. Pinching (P)</b>						
P <sub>1</sub> – No pinching	4.51	4.79	4.61	9.43	9.46	9.42
P <sub>2</sub> – 15 DAT	6.13	6.16	6.14	8.86	8.89	8.87
P <sub>3</sub> – 30 DAT	5.16	5.12	5.14	8.74	8.77	8.75
P <sub>4</sub> – 45 DAT	4.58	4.92	4.75	8.33	8.37	8.35
SE (m) ±	0.13	0.07	0.10	0.07	0.07	0.07
C D at 5 %	0.37	0.22	0.28	0.20	0.20	0.20
<b>B. Cycocel (T)</b>						
T <sub>1</sub> – 500ppm	5.05	5.16	5.07	8.59	8.55	8.59
T <sub>2</sub> – 1000ppm	5.36	5.53	5.44	8.91	8.89	8.91
T <sub>3</sub> – 1500ppm	5.18	5.32	5.25	8.78	8.77	8.78
T <sub>4</sub> – Water spray	4.78	4.98	4.88	9.21	9.19	9.21
SE (m) ±	0.13	0.07	0.10	0.07	0.07	0.07
C D at 5 %	0.37	0.22	0.28	0.20	0.20	0.20
<b>C. Interaction (PxT)</b>						
SE(m) ±	0.15	0.14	0.14	0.15	0.14	0.14
C D at 5 %	--	--	--	--	--	--

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