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Effect of plant growth retardants and spacings on vegetative growth and flower yield of African marigold *(Tagetes erecta* L) cv Pusa Narangi Gainda

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ABSTRACT

A field study was conducted at Horticultural College and Research Institute, Venkataramannagudem to find out the effective growth retardant for vegetative growth and flower yield of African marigold cv Pusa Narangi Gainda. Plants were sprayed with CCC, TIBA, and MH at 750, 1000 and 1250 ppm respectively along with spacings 30 x 20 cm and 40 x 20 cm. Among the growth retardants studied CCC, TIBA and MH suppressed plant height and enhanced the plant spread and number of laterals over control. MH at 1250 ppm enhanced number of flowers and TIBA at 1000 ppm recorded maximum flower diameter. CCC at 750 ppm recorded maximum flower yield per plant and hectare. Among spacings 30 x 20 cm enhanced plant height, inter nodal length and reduced plant spread, number of laterals, number of flowers, flower weight, flower size and yield per plant. Spacing of 40 x 20 cm enhanced the flower size, fresh flower weight, number of flowers and flower yield. CCC at 750 ppm with 30 x 20 cm spacing recorded maximum flower yield of 26.23 tons/hectare.

Keywords: African marigold; growth; plant growth regulators; yield

INTRODUCTION

African marigold *(Tagetes erecta* L) is one of the most popular and commercial flowering annuals cultivated in most of the states in India. It has .great demand during various festivals for garland, cut flower and decorative purposes. It is suitable as potted plant and for bedding, edging, garland making, religious offerings and also for making different products. Therefore there is strong need to boost the production of this crop. The increased productivity can appreciably be achieved through adoption of improved cultural practices. The influence of numerous plant growth substances have been commercially exploited both in green house crops as well as in field crops. The plant growth retardants are commercially used to retard vegetative growth, suppress apical dominance, induce lateral buds and produce more number of

flowers in various crops for easy cultivation and higher flower yield. Work done on use of plant growth retardants for increasing flower size in marigold is meagre. It has been established that spacing plays an important role in manipulating the growth and flower yield. Keeping in view the above facts the experiment was conducted to find out the optimum plant population and to study the effect of different plant growth retardants on growth and flower yield of marigold cv Pusa Narangi Gainda.

MATERIAL and METHODS

The investigations were conducted at Horticultural College & Research Institute, Venkataramannagudem, Tadepalligudem, West Godavari district during the year 2010 with growth retardants viz CCC, TIDA and MH at 750, 1000 and 1250 ppm concentrations respectively with different spacings viz 30 x 20 cm and 40 x 20 cm. The experiment was laid out in randomized block design with factorial concept and replicated thrice. Thirty days old healthy uniform seedlings were transplanted in the main field. Pinching was done thirty days after transplanting with the help of sterilized secateurs. After pinching the prepared plant growth retardants solutions were sprayed with Knapsack sprayer for uniform coverage. In each treatment the plants were sprayed twice at 30 and 45 days after transplanting. The data on vegetative growth and flower yield parameters were recorded and analysed statistically.

RESULTS and DISCUSSION

The results revealed that plant growth retardants and concentrations differed significantly on vegetative parameters. Increase in concentrations of MH, CCC and TIBA significantly reduced plant height over control (92.81 cm). Maximum plant spread (28.57 cm) and number of laterals (16.00) were recorded with MH at 750 ppm (Table 1). The plant growth retardants interact with gibberellins or Indole acetic acid oxidase and lower the diffusible auxins and thereby suppress the growth (Helaey et al 1970).

The interaction between plant growth retardants and spacings differed significantly on vegetative parameters (Table 2). TIBA with 30 x 20 cm spacing recorded maximum plant height (84.42 cm) and MH with 40 x 20 cm recorded minimum plant height (79.19 cm), maximum plant spread (31.18 cm) and number of laterals (16.19) also. Among the spacings studied maximum plant height was recorded with closer spacing 30 x 20 cm (95.68 cm) and maximum plant spread (29.54 cm) and number of laterals (12.99) were recorded with wider spacing 40 x 20 cm (Table 3). With increased plant population at closer spacing (30 x 20 cm) plants grew more vertically than in wider spacing. This might be due to less light penetration into the canopy. Low light availability might have resulted in an increase in inter nodal length by etiolating effect since the auxin synthesized is subjected to less photo

Table 1. Effect of plant growth retardants on vegetative growth of African marigold cv Pusa Narangi Gainda

Growth retardant	Concentration (ppm)	Plant height (cm)	Plant spread (cm)	Number of branches
CCC	750	84.83	28.18	11.62
	1000	82.39	27.59	12.51
	1250	80.26	26.43	13.81
TIBA	750	87.36	24.89	12.87
	1000	84.47	23.94	13.48
	1250	81.34	23.29	13.97
MH	750	81.90	28.57	16.00
	1000	79.81	27.28	15.48
	1250	78.44	26.13	14.81
Control		92.81	26.69	12.58
SEd±		0.50	0.23	0.263
$CD_{0.05}$		1.02	0.47	0.539

Table 2. Effect of plant growth retardants at different spacings on vegetative growth of African marigold cv Pusa Narangi Gainda

Treatment	Plant height (cm)	Plant spread (cm)	Number of laterals
CCC with 30 x 20 cm	84.09	23.72	12.42
TIBA with 30 x 20 cm	84.42	23.62	12.87
MH with 30 x 20 cm	80.90	26.58	14.66
CCC with 40 x 20 cm	80.88	28.08	12.87
TIBA with 40 x 20 cm	84.35	24.36	14.01
MH with 40 x 20 cm	79.19	31.18	16.19
SEd ±	0.41	0.19	0.215
$CD_{0.05}$	0.83	0.38	0.44

Table 3. Effect of spacing on vegetative growth of African marigold cv Pusa Narangi Gainda

Spacing	Plant height (cm)	Plant spread (cm)	Number of laterals
30 x 20 cm	95.68	23.83	12.17
40 x 20 cm	89.94	29.54	12.99
Mean	92.81	26.69	12.58
SEd ±	0.24	0.11	0.124
$CD_{0.05}$	0.48	0.22	0.254

oxidation and destruction which finally results in production of taller plants.

In the three way interaction maximum plant height was recorded with TIBA at 750 ppm with 30 x 20 cm spacing (88.96 cm) and maximum plant spread (32.09 cm) and number of laterals (16.86) were recorded with MH at 750 ppm with 40 x 20 cm spacing (Table 4).

Plant growth retardants at different concentrations showed significant influence on yield parameters (Table 5). CCC at 1250 ppm took minimum number of days to 1st flower bud initiation (52.74 days) and MH at 1250 ppm recorded maximum number of flowers per plant (48.97). TIBA at 1000 ppm recorded maximum flower diameter (6.25 cm) due to less expenditure of reserved food. Production of less number of flowers accounted for increased flower size and individual flower weight. CCC at 750 ppm recorded maximum flower yield per plant (166.62 g) and yield per hectare (24.09 tons). These results are in confirmation with the earlier findings of Sen and Maharana (1972) and Sen and Naik (1972).

The interaction between plant growth retardants and spacings was also found to be significant on yield parameters. MH with 30 x 20 cm recorded early flower bud initiation and MH with 40 x 20 cm recorded maximum flowers per plant (50.80), flower yield per plant (162.95 g) and yield per ha (20.36 tons). Maximum flower diameter of 5.80 cm was recorded in case of TIBA with 40 x 20 cm (Table 6). Early flower bud initiation with MH might be due to the fact that plants build up sufficient food reserves at initial stages of growth due to reduction in plant height. The reserve food material might have been utilized for reproductive growth with restriction on vegetative growth.

Among the spacings studied 30 x 20 cm spacing (62.22 days) recorded early initiation of flowering due to physiological maturity of shoots and wider spacing 40 x

Table 4. Effect of plant growth retardants and spacings on vegetative growth of African marigold cv Pusa Narangi Gainda

Spacing/Growth retardant (ppm)		Plant height (cm)		Spread (cm)		Number of branches	
		30 x 20 (cm)	40 x 20 (cm)	30 x 20 (cm)	40 x 20 (cm)	30 x 20 (cm)	40 x 20 (cm)
CCC	750	86.39	83.26	24.27	29.18	11.17	13.55
	1000	83.95	80.82	23.92	28.54	12.03	12.98
	1250	81.94	78.57	22.74	26.51	14.07	12.07
TIBA	750	88.96	85.75	24.60	25.17	12.37	13.37
	1000	83.98	84.95	23.81	24.06	12.87	14.09
	1250	80.12	82.56	22.67	23.84	13.38	14.56
MH	750	82.74	81.05	27.96	32.09	15.14	16.86
	1000	80.93	78.68	26.02	31.26	14.87	16.09
	1250	79.04	77.83	25.75	30.19	13.98	15.64
		SEd ±	$CD_{0.05}$	SEd ±	$CD_{0.05}$	SEd ±	$CD_{0.05}$
Three way interaction		0.71	1.45	0.39	0.81	0.456	0.762

Table 5. Effect of plant growth retardants at different concentrations on floral characters of African marigold cv Pusa Narangi Gainda

Growth retardant	Conc (ppm)	1st flower bud initiation (days)	Number of flowers/plant	Flower diameter (cm)	Flower yield/ plant (g)	Flower yield (t/ha)
CCC	750	57.46	43.85	4.68	166.62	24.09
	1000	56.21	34.80	4.37	117.91	17.13
	1250	52.74	32.77	5.00	95.75	13.92
TIBA	750	60.31	37.24	5.17	138.92	19.99
	1000	63.06	31.98	6.25	122.69	17.67
	1250	63.64	29.58	5.56	108.28	15.64
MH	750	54.34	45.63	4.76	156.5	22.71
	1000	53.71	48.01	4.97	159.43	23.13
	1250	55.44	48.97	5.17	159.76	23.18
Control	-	63.15	26.06	4.34	62.85	16.34
SEd ±		0.24	0.43	0.05	3.1	0.47
$CD_{0.05}$		0.5	0.88	0.1	6.35	0.98

Table 6. Effect of plant growth retardants and spacings on floral characters of African marigold cv Pusa Narangi Gainda

Treatment	1st flower bud	Number of flowers/plant initiation (days)	Flower diameter (cm)	Flower yield/ plant (g)	Flower yield (t/ha)
CCC with 30 x 20 cm	56.22	35.34	4.81	122.64	20.4
TIBA with 30 x 20 cm	61.84	31.44	5.51	114.14	18.99
MH with 30 x 20 cm	54.27	44.26	4.71	154.17	25.65
CCC with 40 x 20 cm	56.71	38.93	4.95	130.87	16.35
TIBA with 40 x 20 cm	62.83	34.42	5.80	132.44	16.55
MH with 40 x 20 cm	55.38	50.80	5.22	162.95	20.36
SEd ±	0.2	0.35	0.04	2.53	0.38
$CD_{0.05}$	NS	0.72	0.08	5.18	0.79

Table 7. Effect of spacing on floral characters of African marigold cv Pusa Narangi Gainda

Spacing	1st flower bud	Number of flowers/plant initiation (days)	Flower diameter (cm)	Flower yield/ plant (g)	Flower yield (t/ha)
30 x 20 cm	62.22	25.19	4.11	56.56	17.42
40 x 20 cm	64.08	26.93	4.57	69.13	15.32
Control	63.15	26.06	4.34	62.85	16.35
SEd ±	0.12	0.2	0.02	1.46	0.22
$CD_{0.05}$	0.24	0.42	0.05	2.99	0.46

20 cm recorded maximum number of flowers (26.93), flower diameter (4.57 cm) and flower yield per plant (69.13 g). Karuppaiah and Krishna (2005) reported that at wider spacing more vegetative growth had occurred and due to late flowering which in turn resulted in bigger size and more flower weight but maximum flower yield per hectare was recorded with closer spacing 30 x 20 cm (17.42 tons) due to increased plant population per unit area (Table 7).

Table 8. Effect of plant growth retardants and spacings on floral characters of African marigold cv Pusa Narangi Gainda

Spacing/Growth retardant (ppm)		Days to 1st flowering		Number of flowers/ plant		Flower diameter (cm)		Flower yield/ plant (g)		Flower yield (t/ha)	
		30 x 20 (cm)	40 x 20 (cm)	30 x 20 (cm)	40 x 20 (cm)	30 x 20 (cm)	40 x 20 (cm)	30 x 20 (cm)	40 x 20 (cm)	30 x 20 (cm)	40 x 20 (cm)
CCC	750	57.19	57.72	40.90	46.80	4.53	4.82	157.68	175.55	26.23	21.94
	1000	56.03	56.38	33.84	35.75	4.93	5.01	115.61	120.20	19.23	15.02
	1250	55.44	56.04	31.28	34.25	4.96	5.03	94.63	96.87	15.74	12.10
TIBA	750	59.36	61.26	35.85	38.62	4.94	5.39	127.23	150.60	21.17	18.82
	1000	62.73	63.38	29.83	34.12	6.13	6.37	113.08	132.29	18.81	16.53
	1250	63.43	63.84	28.63	30.52	5.47	5.65	102.11	114.44	16.99	14.30
MH	750	53.95	54.72	42.18	49.08	4.44	5.08	152.09	160.90	25.30	20.11
	1000	54.04	55.37	44.86	51.15	4.78	5.16	154.98	163.87	25.78	20.48
	1250	54.93	56.04	45.75	52.18	4.90	5.44	155.43	164.09	25.86	20.51
		SEd ±	$CD_{0.05}$	SEd ±	$CD_{0.05}$	SEd ±	$CD_{0.05}$	SEd ±	$CD_{0.05}$	SEd ±	$CD_{0.05}$
Three way interaction		0.42	0.87	0.75	1.53	0.09	0.15	5.37	8.98	0.82	1.18

In the three way interaction the combination of MH at 750 ppm with 30 x 20 cm spacing recorded early flower bud initiation (53.95 days). MH at 1250 ppm with 40 x 20 cm spacing recorded maximum number of flowers (52.18) whereas TIBA at 1000 ppm with 40 x 20 cm spacing recorded maximum flower diameter (6.37 cm) and CCC at 750 ppm with 30 x 20 cm spacing recorded maximum flower yield of 26.23 tons / hectare (Table 8).

REFERENCES

Helaey AH, Showl SP and Shilo R 1970. Promotion of growth and flowering and increase in content of endogenous gibberellins in gladiolus plants treated with growth retardant CCC. Physiologia plantaru **23:** 320-327.

Karuppaiah P and Krishna G 2005. Response of spacings and nitrogen levels on growth, flowering and yield characters of French marigold *(Tagetes patula* Linn). Journal of Ornamental Horticulture **8(2):** 96-99.

Sen SK and Maharana T 1972. Effects of some regulators on the growth and flowering of Chrysanthemum *(Chrysanthemum morifolium* Ram). Indian Journal of Horticulture **29:** 237-240.

Sen SK and Naik J 1972. Growth and flowering response of pinched and unpinched Chrysanthemum to growth regulator treatments. Indian Journal of Horticulture **29:** 86-90.

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