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Influence of Foliar Application of Gibberellic Acid and NAA on Growth, Quality and Flower Yield in African Marigold

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Abstract—*A field experiment was conducted at farm of Horticulture Section, College of Agriculture, Nagpur during winter season of 2013-2014 with view to study the effect of different concentrations of GA_3 (100, 200, 300 and 400 ppm) and NAA (50,100, 150 and 200 ppm) on growth, quality and flower yield in African marigold. The result revealed that, vegetative growth viz., height of plant (43.56 cm), number of branches (10.83), spread of plant at 50 % flowering stage E-W (24.77) and N-S (24.92) was recorded significantly maximum with treatment of GA_3 at 400 ppm, whereas, stem diameter (1.27 cm) of plant were found maximum with the treatment NAA 50 ppm. In respect of quality parameters, viz., length of pedicel (7.05 cm), length of flower along with pedicel (10.69), shelf life (4.68 days) was found maximum with the treatment of GA_3 400 ppm whereas, treatment NAA 50 ppm had produced significantly maximum weight (6.10 g) and diameter of fully opened flower (6.51 cm). Regarding yield contributing characters viz., number of flowers plant^{-1}(48.66), flower yield plant^{-1} (254.00 g) and ha^{-1}(187.96 q) were recorded maximum at GA_3 400 ppm.*

1. INTRODUCTION

Marigold is mostly grown for cut flowers as well as loose flowers for making garlands or grown as bedding flowering plant in garden display. The globular shaped flowers with long stalks are used for cut flower purpose.

Now a days the use of growth regulators play an important role by increasing, reducing or modifying the physiological process within plant and which ultimately affect the growth, flowering and yield. Gibberellins and NAA fall in growth promote group of plant hormones. Gibberellic acid and NAA plays a vital role in improving the vegetative growth characters of the plants as it enhances the elongation and cell division by promoting the DNA synthesis in the cell. It reduced the juvenile phase due to increase in photosynthesis and respiration with enhanced co_2 fixation in the plant. Gibberellic acid helps to produce the good quality flower and increased flower yield in marigold.

Therefore, present experiment was undertaken in order to study the effect of GA_3, NAA on growth and yield of African marigold.

2. MATERIAL AND METHODS

A field experiment was carried out at farm of Horticulture Section, College of Agriculture, Nagpur during *rabi* season of the year 2013-2014.The experiment was laid out in a Randomized Block Design with three replications. The experiment comprised with nine treatment *viz.* T_1 - GA_3 100 ppm, T_2 - GA_3 200 ppm, T_3 - GA_3 300 ppm, T_4 - GA_3 400 ppm, T_5 - NAA 50 ppm, T_6 - NAA 100 ppm, NAA T_7 - 150 ppm and T_8 - NAA 200 ppm and T_9 - Control.

The African marigold variety F_1 hybrid seed was procured from local source. The seeds were sown after filling the mixture of 70% cocopeat, 15%perlite and 15%soil in protray under control condition. The seed was sown on 27 September 2013. Four week old seedlings were used by transplanting. The transplanting was done at a spacing of 45×30cm distance. A recommended dose of fertilizers *viz*., 100 kg nitrogen, 50 kg phosphorus and 25 kg potassium ha^{-1} was applied through urea, single super phosphate and murate of potash. Half dose of nitrogen and full dose of phosphorus and potash was applied at the time of transplanting in all treatment plots and the remaining half of nitrogen was applied as top dressing after 30 days of transplanting.

Regarding treatments of GA_3 at 100, 200, 300 and 400 ppm and NAA at 50,100,150,200 ppm was prepared as per treatment concentration with distilled water just before their use. Foliar application of GA_3 and NAA was applied twice at 15 and 30 days after transplanting as per treatment. Spraying was done in the morning hours on both the surface of the leaves and apical meristem. Various observations were recorded on five randomly selected plants in each treatment plot and in each replication on various growth parameters like, height of plant, Stem diameter (cm) and branches plant^{-1} was recorded at 90 days of transplanting, spread of plant was recorded at 50 % flowering stage, and yield parameters like number of flower, yield of flower plant^{-1} and ha^{-1} were recorded at the time of harvesting.

3. RESULTS AND DISCUSSION

3.1 Growth parameters

Data from table 1 revealed that, foliar application of gibbarllic acid, plant height (43.56 cm), number of branches plant^{-1} (10.83), spread of plant E-W (24.77 cm) and N-S (24.92 cm) were recorded significantly maximum under the treatment GA_3 400 ppm which was statistically at par with the treatments GA_3 300 ppm and followed by the treatments GA_3 200 ppm and GA_3 100 ppm.

Table 1: Response of foliar application of GA_3 and NAA on vegetative growth parameters in African marigold

Treatments	Height of plant (cm)	Stem diameter (cm)	Branches plant^{-1}	Spread of plant at 50 % flowering (cm)	
				E-W	N-S
T_1 – GA_3 100 ppm	38.73	1.17	9.45	22.68	23.19
T_2 – GA_3 200 ppm	39.10	1.18	9.49	24.19	24.66
T_3 – GA_3 300 ppm	41.85	1.19	9.81	24.68	24.71
T_4 – GA_3 400 ppm	43.56	1.20	10.83	24.77	24.92
T_5 – NAA 50 ppm	38.68	1.27	9.43	22.34	22.76
T_6 – NAA 100 ppm	34.62	1.26	9.41	21.41	22.24
T_7 – NAA 150 ppm	33.56	1.21	9.26	21.22	21.42
T_8 – NAA 200 ppm	32.82	1.21	9.20	20.95	21.20
T_9 – Control (Water spray)	31.69	1.13	8.34	19.32	20.61
SE (m) ±	1.46	0.01	0.27	0.68	0.44
CD at 5%	4.39	0.05	0.82	2.05	1.32

As regard foliar application of NAA, plant height (38.68 cm), number of branches plant^{-1} (9.43), spread of plant E-W (22.34 cm) and N-S (22.76 cm), Stem diameter (1.27 cm) were recorded significantly maximum under the treatment NAA 50 ppm which was statistically at par with the treatments NAA 100 ppm and followed by the treatments NAA 150 ppm and NAA 200 ppm. However, minimum plant height (31.69 cm), number of branches plant^{-1} (8.34) and spread of plant E-W (31.69 cm) and N-S (24.68 and 24.71 cm) were recorded in control treatment.

From above results, it is showed that gibberellic acid 400 ppm and NAA 50 ppm had significantly increased vegetative parameters in African marigold. This might be due to the fact that, an application of gibberellic acid at different concentrations the growth of plant increased by increasing intermodal length and due to cell division and cell enlargement and enhancement the apical dominance. Similar results were recorded Swaroop *et al*. (2007) and Yadav *et al.* (2013) in African marigold. They reported that, GA_3 300 ppm was recorded maximum vegetative growth parameters.

Similarly, NAA plays a vital role in improving the vegetative growth characters of the plants might be due to the fact that NAA, being a member of auxin group promotes vegetative growth by active cell division and cell elongation. Similar results were recorded by Kanwar and Khandelwal (2013) in African marigold. They reported that, NAA 200 ppm was recorded maximum vegetative growth parameters.

3.2 Yield parameters

The data from table 2 revealed that, treatment GA_3 400 ppm recorded maximum number of flowers plant^{-1} (48.66), yield of flower plant^{-1} (254.00 g) and ha^{-1} (187.96 q) which was found to be at par with the treatment GA_3 300 ppm and NAA 50 ppm. However, significantly minimum number of flowers plant^{-1} (29.33), yield of flower plant^{-1} (110.86 g) and ha^{-1} (82.09 q) were recorded in control treatment.

Table 2: Response of foliar application of GA_3 and NAA on flower yield and quality in African marigold

Treatments	Number of flowers plant^{-1}	Yield of flowers plant^{-1} (g)	Yield of flowers ha^{-1} (q)	Weight of flower (g)	Diameter of fully opened flower (cm)	Length of pedicel (cm)	Length of flower along with pedicel (cm)	Shelf life (days)
T_1 – GA_3 100 ppm	42.33	180.45	133.64	4.23	5.36	6.16	9.54	2.08
T_2 – GA_3 200 ppm	43.00	180.34	133.33	4.38	5.53	6.30	10.13	2.13
T_3 – GA_3 300 ppm	46.66	214.63	158.95	4.60	5.56	6.84	10.51	3.26
T_4 – GA_3 400 ppm	48.66	254.00	187.96	5.22	5.64	7.05	10.69	4.68
T_5 – NAA 50 ppm	41.33	252.11	186.72	6.10	6.51	6.19	9.53	3.25
T_6 – NAA 100 ppm	39.33	210.80	155.86	5.36	6.31	6.17	9.41	2.12
T_7 – NAA 150 ppm	37.33	195.60	144.75	5.24	6.20	5.84	8.87	2.06
T_8 – NAA 200 ppm	35.33	157.57	116.66	4.46	5.63	5.72	8.56	2.03

T_9 – Control (Water spray)	29.33	110.86	82.09	3.78	4.58	4.52	7.14	2.02
SE (m) ±	1.58	11.38	6.86	0.28	0.28	0.25	0.38	0.14
CD at 5%	4.76	34.13	20.57	0.84	0.85	0.75	1.14	0.42

From above results, it is showed that gibberellic acid 400 ppm and NAA 50 ppm. This might be due to the fact that, the increase in yield and yield parameters with GA_3 spray may be due to better crop growth, more number of branches thus increased higher number of flowers plant^{-1}. Similar results were recorded Sunitha *et al*. (2007) and Kumar *et al.* (2010) in African marigold. They reported that, GA_3 200 ppm was recorded maximum yield parameters.

3.3 Quality parameters

Data from table 2 revealed that, foliar application of NAA 50 ppm recorded significantly maximum weight of flower (6.10 g), diameter of fully opened flower (6.51 cm) which was statistically at par with the treatments NAA 100 ppm and NAA 150 ppm Whereas, significantly minimum weight of flower and diameter of fully opened flower was recorded under control treatment. Application of naphthalene acetic acid noted maximum weight of flower and diameter of flower in African marigold. The increase in these floral characters might be due to the fact that NAA enhanced rate of respiration resulting in production of metabolic energy which would have been utilized by plants for cellular expansion and tissue growth resulting in the improvement on weight of flowers and diameter of flower. The results obtained in this investigation are in close agreement with the findings of Pandey and Chandra (2008) in French marigold and Kanwar and Khandelwal (2013) in African marigold. They reported that, NAA 200 ppm was recorded maximum vegetative growth parameters.

As regard foliar application of GA_3, length of pedicel (7.05 cm), length of flower along with pedicel (10.69) and more shelf life (4.68 days) were recorded significantly maximum under the treatment 400 ppm which was statistically at par with the treatments GA_3 300 ppm, GA_3 200 ppm and followed by GA_3 100 ppm and NAA 50 ppm. However, significantly minimum length of pedicel and minimum shelf life was recorded with the control treatment.

The favorable effect of GA_3 might be attributed due to that GA_3 promotes cell division and cell elongation resulting in longer pedicel length. The results are in conformity with the findings of Tyagi and Kumar (2006) reported that GA_3 200 ppm recorded maximum length of pedicel in African marigold. Kumar *et al*. (2010) reported that GA_3 200 ppm recorded maximum shelf life of flower in African marigold.

REFERENCES

[1] Girisha, R., A. M. Shirol., K. V. Patil and B. S. Kulkarni., Effect of different plant growth regulators on growth, flowering, and quality of Daisy (*Aster amellus L.*) *cv*. Dwarf pink. Indian Hort. J. 1-2 Jan-Jun 2012, pp. 39-42.

[2] Kanwar, J. and S. K. Khandelwal., Effect of plant growth regulators on growth and yield of African marigold (*Tagetes erecta Linn.*). Madras Agric. J. 1-3 March 2013, pp. 45-47.

[3] Kumar Ramesh, Ram Mohan and G. S. Gaur., Effect of GA_3 and ethrel on growth and flowering of African marigold *cv.* Pusa Narangi Gainda. Indian J. Hort. 67 November 2010, pp. 362-366.

[4] Pandey, A. K. and Hem Chandra., Effect of various plant growth regulators on growth and flowering of French marigold (*Tagetes patula L.*). Indian J. Hort. 40 2008, pp. 96-99.

[5] Sunitha, H. M., Ravi Hunje, B. S. Vyakaranahal and H. B. Bablad., Effect of pinching and growth regulators on plant growth, flowering and seed yield in African marigold (*Tagetes erecta* L.) J. Orna. Hort. 10, 2, April-Jun 2007, pp. 91-95.

[6] Swaroop, Kishan, K. P. Singh and D. V. S. Raju., Vegetative growth, flowering and seed characters of African marigold (*Tagetes erecta L.*) as influenced by different growth substances during mild off season. J. Orna. Hort. 10, 4, October-December 2007, pp. 268 - 270.

[7] Tyagi, A. K. and Vijai Kumar., Effect of gibberellic acid and vermicompost on vegetative growth and flowering in African marigold (*Tagetes erecta L.)*. J. Orna. Hort. 9, 2, April-Jun 2006, 150-151.

[8] Yadav, H. K., A. K. Singh., H. K. Singh and Bhupendra Kumar., Response of African marigold (*Tagetas erecta L.*) to various plant growth regulators. Agric. and Biological Res. **29**, 2, 2013, pp.139-141.