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Effect of foliar spray of gibberellic acid on growth, flowering and yield of African marigold (*Tagets erecta L.*)

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ABSTRACT

A field experiment was conducted during rabi season of 2017-2018 at Research farm, R.B.S College, Bichpuri, Agra (U.P.) to study the effect of gibberellic acid on growth, flowering and yield of African marigold (Tagetserecta L.).These treatments were evaluated in randomized block design with four replications. The results revealed that the gibberellic acid had beneficed effect on all the growt, and flowering yield parameters of African marigold. The maximum plant height (73.6 cm), diameter of main stem (6.2cm), plant spread N-S and E-W (53.5cm and 51.9cm), primary branches/plant (12.7), length of longest primary branches (44.0cm) days of bud initiation (50.3), flower/plant(53.2), weight of flower /plant(300.2g), length of flower (9.1cm), weight of flower (7.2g) and flower yield (187.6q ha^{-1}) were recorded with foliar spray of 300 ppm solution of gibberellic acid, foliar spray of 200ppm solution of GA_3 was statistically at par with 300ppm GA_3 in respect of these parameters. The spraying of 200ppm solution was significantly superior to control in respect of flowering attributes but maximum values were recorded with 300 ppm of GA_3.

Keywords: GA_3, growth, flowering, flower yield, African marigold

INTRODUCTION

Marigold (*Tagetserecta L.*) is one of the most popular flower due to long duration of flowering ease of cultivation, wide adaptability and attractive coloured flowers and excellent keeping quality .Flowers are extensively used as loose flowers, religious offerings, garland making etc. Besides its ornamental value, marigold petals are the most concentrated source of xanthophylls and a rich source of lute in (80-90%). A dry petal of marigold flower contains about 90% arytenoids. These dried petals and concentrates are used as feed additive to improve the pigmentation of the poultry skin and egg to laying hens. Some studies indicate the effectiveness of the latter in the prevention of coronary artery disease, heart attacks, immune response, old age and cancer. In some regions of Mexico it is used in digestive ailments, such as stomach pain, as well as diarrhea, colic, liver problems, bile, vomiting, and indigestion. The plant also produces intestinal washes, and is used against intestinal parasites and as a carminative. Other uses include respiratory diseases such as colds, flu, bronchitis and nasal congestion as well as gynecological problems. Gibberellins are used in ornamental crop extensively for modifying the developmental processes (Sendhilnathan *et al.* 2019). The GA_3have successfully played their role in commercial flowers as growth control, prevention of bud dormancy, promotion of flowering, prolonging the vase life of flowers and retarding their senescence. Thus, a study was under taken to evaluate the effect of foliar spray of GA_3 on growth, flowering and yield of African marigold Cv. Pusa narangi gainda.

METHODS AND MEERIALS

The field experiment was carried out at the horticulture research farm, Raja Balwant Singh College, Bichpuri, Agra (U.P.) during rabi season of 2017-18. The experimental site is situated at 27.2^0 N latitude 78.5^0 East longitudes at height of 168m above the mean sea level. The soil of experimental field was sandy loam in texture having good water holding capacity and alkaline in reaction (pH 7.5).The soil was sufficient in available potassium (168.0 kg ha^{-1}), medium in available phosphorus (14.0 kgha^{-1}) but low in available nitrogen (147 kg ha^{-1}) and organic carbon (3.0g kg^{-1}). The investigation was laid out in randomized block design with five treatments viz. T_1 control, T_2 50ppm, T_3 100ppm, T_4 200ppm, T_5 300ppm and four replications. Twenty five days old seedlings were transplanted in the field at a spacing of 30 cm x 45 cm. Recommended dose of nitrogen, P and K

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fertilizers were applied as basal through urea, diammonium phosphate and muriate of potash, respectively. Four concentrations of gibberellic acid (50,100,200 and 300 mg) were sprayed twice, at 30 and 40 days after transplanting. Control plants were sprayed with tap water. Observations on vegetative growth characters viz. plant height, diameter of main stem , number of primary branches, length of longest primary branches , plant spread (N-S), plant spread (E-W), flowering characters like days to flower bud initiation, number of flower per plant, weight per flower, length of flower, weight of flower per plant, flower yield were recorded at peak stage. The data on various parameters were analysed statistically as suggested by Panse and Sukhatme (1995).

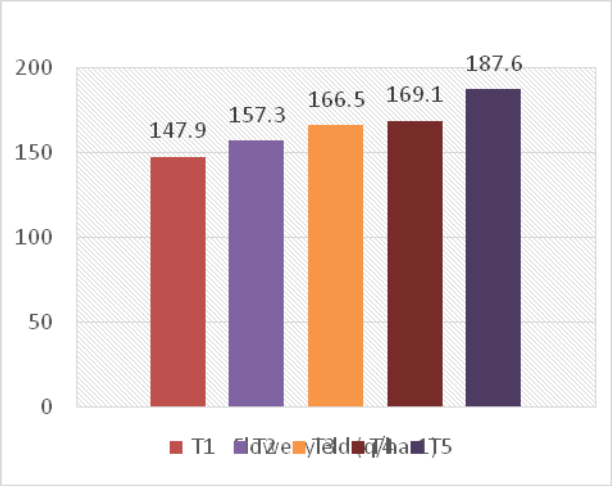
RESULTS AND DISCUSSION

The data (Table1**)** revealed the application of GA_3 significantly influenced the growth parameters. The maximum plant height (73.6cm) was recorded with 300ppm GA_3 (T_5) followed by T_4 and T_3 and minimum with T_1 (control). The maximum number of primary branches (12.74) and length of longest primary branch (44.07cm) were recorded when the plants were sprayed with T_5 ($GA_3$300 ppm) followed by T_4 ($GA_3$200 ppm). While, these growth parameters were minimum in control (T_1). Similar result were also reported by Pal*et al.* (2018) and Gayatri*et al.*(2019) in marigold. The maximum diameter of main stem (2.23cm) and plant spread N-S and S-E (53.57cm and 51.93cm respectively) were also reported with T_5 (300ppm GA_3) followed by T_4 (200ppm GA_3 . Pal*et al.*,(2018) in African marigold observed good response of $GA_3$with regards to diameter of main stem and spread of plant. The favourable effect of GA_3 might be attributed to the cell elongation.

The data in (Table 2) clearly showed that the earliest bud initiation in marigold was found in parts treated with 300ppm GA_3 (T_5) being at par with 200ppm GA_3 (T_4). Bud initiation was 33.3 days earlier with T_5 as compared to control. Similar results were reported by Kumar *et al.* (2014) in African marigold. The application of $GA_3$300ppm (T_5) resulted in maximum number of flower per plant, weight of flower (300.23g) per plant, length of flower (9.12cm) and flower weight (7.26g), which were significantly superior as compared to control (T_1).

Table 1: Effect of GA_3 on vegetative growth of African marigold

Gibberlic acid (ppm)	Plant height (cm)	Primary branches	Length of longest primary branches	Diameter of main stem	Plant spread cm (N-S)	Plant spread cm (E-W)
0	69.0	10.0	38.7	1.7	48.7	47.8
50	70.2	10.4	40.4	1.9	50.7	49.2
100	70.4	10.9	41.4	1.9	52.0	50.1
200	71.4	11.8	42.4	2.0	52.5	51.3
300	73.6	12.7	44.0	2.2	53.5	51.9
CD(P=0.05)	1.63	1.35	1.73	0.7	1.1	1.4



The results obtained are in line with the finding of Meshram*et al.*, (2015) in African marigold.The flower yield of African marigold increased at all the levels of GA_3 over the control and was maximum (187.64 q ha^{-1}) at 300ppm GA_3 (T_5). Application of bioregulater seems to encourage the development of flower parameter which may be due to cumulative effect of foliar application of GA_3 on enhanced cell division and cell enlargement. These results confirm the findings of Kanwar and Khandelwal (2013) and Sendhilnathan *et al.* (2019) in African marigold.

Table2: Effect of GA_3 on flowering parameters and yield of African marigold

Gibberlic acid (ppm)	Days to bud initiation	Flower per plant	Weight of flower plant (g)	Length of flower (cm)	Weight flower (g)	Flower yield ($q/ha^{-1)}$
0	53.6	43.8	236.7	6.0	5.6	147.9
50	51.8	45.9	251.7	6.7	6.3	157.3
100	51.1	48.9	266.4	7.3	6.4	166.5
200	50.9	51.9	270.0	8.0	6.8	169.1
300	50.3	53.2	300.2	9.1	7.2	187.6
CD(P=0.05)	1.0	1.1	17.1	0.6	0.6	10.6

Based on present investigation, it may be concluded that large and healthy plants, earlier flowering and reasonable quality, profuse flowering and flowers yield was obtained by the foliar application of 300ppm gibberellic acid than other levels of GA_3.

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