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Medha Saha
Department of Floriculture and Landscape Architecture, IGKV, Raipur, Chhattisgarh, India

Neeraj Shukla
Department of Floriculture and Landscape Architecture, IGKV, Raipur, Chhattisgarh, India

Sangeeta
Department of Fruit Science, IGKV, Raipur, Chhattisgarh, India

Corresponding Author:
Medha Saha
Department of Floriculture and Landscape Architecture, IGKV, Raipur, Chhattisgarh, India

Enhanced effect on growth of Marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda due to application of GA_3 and Ethrel

Medha Saha, Neeraj Shukla and Sangeeta

Abstract
The present investigation entitled "Enhanced effect on growth of Marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda due to application of GA_3 And Ethrel" was carried out at Indira Gandhi Krishi Vishwavidyalaya, Raipur, during rabi 2017-18. The experiment was conducted in Randomised Block Design with 7 treatments of 3 levels of GA_3 (200, 300, 400 ppm), 3 levels of Ethrel (400, 500, 600 ppm) and replicated in three times. Among all treatments GA_3 400 ppm resulted in maximum plant height and no. of leaves per plant. Ethrel 500ppm resulted in maximum number of branches. Hence, on the basis of result obtained from the present investigation it can be concluded that foliar application of GA_3 400ppm at 15 DAT and 30 DAT was found most effective with respect to vegetative growth character of marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda.

Keywords: Marigold, GA_3, Ethrel, growth characters

Introduction
Marigold (*Tagetes erecta* L.), family Asteracae which is originated from Central and South America basically from Mexico. It is an important commercial annual flower. Marigold is grown as an ornamental crop for its flowers, which are sold in the market as loose flowers in bulk, as specialty cut flowers, or for making garlands or for decoration during several religious functions. They are also excellent landscape plants, widely used for bedding purpose, in herbaceous borders and also be grown in pots. Apart from its significance in ornamental horticulture, it has been valued for other purposes too. The aromatic oil extracted from marigold is called as "tagetes oil". It is used in preparation of high grade perfumes and also as an insect fly repellent. Marigold acts as a trap crop to control fruit-borer in tomato and suppresses the nematode population in soil. Growth regulators are extensively used in ornamental crops for modifying and regulating their developmental process. These chemical are helpful in controlling the plant height, time of flowering and size of flower etc. when applied at right time at proper concentration. Gibberellins (GA_3) fall in growth promoter group. Ethrel retard plant height, no. of nodes and internodal length, increased branching and delayed flowering.

Materials and Methods
The investigation was conducted during Rabi season 2017- 18 at Horticultural Research cum Instructional Farm, Department of Floriculture and Landscape Architecture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) the seed sowing was done on 16 October 2017. The experiment was laid out in a Randomised Block Design with three replication having a plot size 2.0m × 1.6m. The seedlings were transplanted 25-30 days after sowing in the evening at a spacing of 40cm × 40cm. A recommended dose of fertilizers *viz.*100 kg nitrogen, 50 kg phosphorus and 25 kg potash per hectare 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 remaining half dose of nitrogen was applied as top dressing after 30 DAT. Irrigation was done just after transplanting and subsequently when needed. Harvesting of flowers were done during cool hours in morning and evening.
The treatment include three levels of Gibberellic acid (200, 300 and 400 ppm), Ethrel (400, 500 and 600 ppm). PGR sprays at 15 DAT and 30 DAT whereas, 30 DAT pinching will be done before PGR spray at 30 DAT. Pinching is common to all the treatments.

The vegetative characters such as plant height, no. of branches per plant and no. of leaves per plant were recorded.

Result and Discussion

Vegetative growth characters

Plant height (cm)

The result revealed that higher plant height (70.800 cm) was observed with the application 400 ppm GA3+ pinching which was closely followed by 300 ppm GA3 + pinching, minimum plant height (47.05 cm) was noticed under the treatment, Ethrel 600 ppm+ pinching. Promotive effect of gibberellin on growth may be due to increasing auxin level in tissues or enhancement of the conversion of tryptophane to IAA which caused the cell division and cell elongation. Similar results were also reported by Kanwar *et al.* (2013) [3] and Badge *et al.* (2014) [1]

Number of branches per plant

The maximum number of branches (59.33) was recorded with ethrel 500 ppm+ pinching which was followed by GA3 400 ppm+ pinching. Least branching (34.20) was noticed in control followed by GA3 200 ppm+ pinching. Ethrel being growth retardant supress stem elongation, reduce apical dominance, causing increase in branching and laterals. It was closely followed by GA3 400 ppm+ pinching, this significant increase in number of branches per plant might be because of more vegetative growth especially height of the plant due to application of GA3 in optimum dose (400 ppm)+ pinching thus resulting in promotion of lateral branches. These results are in close conformity with the study of Pandey and Chandra (2008) [7], Mishra (2017) [6]

Number of leaves per plant

The highest no. of leaves per plant (30.99) was observed with the application 400 ppm GA3 + pinching which was closely followed by 300 ppm GA3+ pinching, minimum no. of leaves per plant (22.20) was noticed under control followed by (23.50) the treatment T6 *i.e.*, Ethrel 600 ppm+ pinching. It may be due to increase in plant height and number of branches. Similar results were also reported by Das *et al.* (1992) [2], Sujatha *et al.* (2002) [9], Kumar *et al.* (2012) [4-5] Palei *et al.* (2016) [8]

Table: Effect of GA_3 and ethrel application on plant height, number of branches and leaves per plant of Marigold (Tagetes erecta L.) cv. Pusa Narangi Gainda

Treatment No.	Treatments	Plant height (cm)	No. of branches per plant	No. of leaves per plant
T1	GA_3 200 ppm + pinching	65.147	37.667	25.733
T2	GA_3 300 ppm + pinching	67.000	42.000	27.100
T3	GA_3 400 ppm + pinching	70.800	53.600	30.933
T4	Ethrel 400 ppm + pinching	51.513	55.933	25.233
T5	Ethrel 500 ppm + pinching	50.313	59.333	24.867
T6	Ethrel 600 ppm + pinching	47.053	58.533	23.500
T7	(Control)+pinching	55.847	34.200	22.200
	SE (m) ±	1.633	1.995	0.703
	CD at 5%	5.087	6.217	2.191

Conclusion

On the basis of the result obtained from this experiment it can be concluded that spray of GA_3 400 ppm at 15 DAT and 30DAT along with pinching was very effective with respect to the plant height, no. of leaves per plant but Ethrel 500 ppm with pinching was found best for number of branches per plant of marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda.

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