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STUDIES ON RESPONSE OF AFRICAN MARIGOLD TO PLANT GROWTH REGULATORS FOR SEED PRODUCTION

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Abstract

A field experiment was conducted at College of Agriculture, Nagpur (M.S.), India during summer season of the year 2012-2013 to study the response of African marigold to plant growth regulators *viz.* GA_3 100 ppm, GA_3 200 ppm, GA_3 300 ppm, GA_3 400 ppm, NAA 100 ppm, NAA 200 ppm, NAA 300 ppm, NAA 400 ppm and control as foliar spray for higher and better quality seed production. The results revealed that, significantly maximum plant height at 60 DAT, seed yield plot^{-1}, seed yield ha^{-1}, weight of seeds flower^{-1} and longevity of intact flower were recorded with the treatment of GA_3 300 ppm and it was statistically at par with all other levels of GA_3 and 100 ppm NAA, whereas, the treatment of NAA 400 ppm recorded significantly maximum branches plant^{-1}. Significantly early first flower bud initiation and 50 per cent flowering were observed with the treatment of GA_3 300 ppm.

Key words : African marigold, flowering, growth, growth regulators, seed yield.

Introduction

Flowers are important for their economic use as well as aesthetic value. Among the flowers grown by farmers, marigold (*Tagetes erecta* L.) has its own importance. It has gained popularity among flower growers because of its easy cultivation and wide adaptability. The growers are attracted towards marigold flower as it has a habit of free flowering, short duration to produce marketable flowers of attractive colours and good keeping quality. Marigold flower has more demand during festival period especially on Diwali and Dashehara. There is a constant demand for theses flowers throughout the year for various functions, festivals and floral decorations. Hence, the area under this crop in Vidarbha region of Maharashtra State and thereby demand for good quality seed of marigold is also increasing day by day. For maximization of seed yield and quality of African marigold some advanced techniques like use of growth regulators are required to be followed besides usual cultural and management practices.

In Vidarbha region, marigold is cultivated on a large scale but productivity is low and there is no proper recommendation based on latest technology to increase the yield potential. Non-availability of high quality seed of marigold is one of the major constraints to its cultivation. Various research workers have reported that, the application of growth regulators helps to increase the yield of good quality seed of African marigold. The present investigation was therefore carried out to study the response of African marigold to plant growth regulators for higher production of better quality seed.

Materials and Methods

A field experiment was carried out during Summer season of year 2012-2013 at the Horticulture Section, College of Agriculture, Nagpur (M. S.), India. Nagpur city comes under Vidarbha region of Maharashtra state. It is situated in the sub-tropical zone at the latitude of $21^0$10' N and longitude of $79^0$19' E. The altitude of the place is 321.26 meters above the mean sea level. The mean annual precipitation on the basis of last fifteen years is 1250 mm which is received almost from the south-west monsoon. The experiment was laid out with nine treatments in randomized block design with three replications. The treatments comprised of Control ($\mathbf{T_1}$), GA_3 100 ppm ($\mathbf{T_2}$), GA_3 200 ppm ($\mathbf{T_3}$), GA_3 300 ppm ($\mathbf{T_4}$), GA_3 400 ppm ($\mathbf{T_5}$), NAA 100 ppm ($\mathbf{T_6}$), NAA 200 ppm ($\mathbf{T_7}$), NAA 300 ppm ($\mathbf{T_8}$) and NAA 400 ppm ($\mathbf{T_9}$). After preparing the land the field was laid out in flat beds of size 2.7 × 2.1 m *i.e.* 5.67 m^2. Uniform and healthy seedlings of African marigold var. 'African Double

Orange' were transplanted in the beds at 45 × 30 cm spacing. The GA_3 and NAA solutions of respective concentration were sprayed twice, first at 20 days after transplanting and second at 30 days after transplanting as per the treatment. All the intercultural operations were followed as and when required. The various observations on growth, flowering and seed yield characters *viz*. branches per plant, plant height at 60 DAT, days for first flower bud initiation, days for 50 per cent flowering, longevity of intact flower, seed yield $plot^{-1}$, seed yield ha^{-1} and weight of seeds $flower^{-1}$ were recorded and the data was statistically analyzed.

Results and Discussion

Results obtained are summarized in table 1. Analysis of variance revealed that, all growth, flowering and seed yield parameters of African marigold were significantly influenced by growth regulators.

Growth study

Significantly maximum branches $plant^{-1}$ (17.60) were found with the treatment NAA 400 ppm which was statistically at par with the treatments NAA 300 ppm (17.30) and NAA 200 ppm (16.67), whereas, minimum branches (11.93) were recorded in the control treatment. An increase in number of branches $plant^{-1}$ with the increasing level of NAA might be due to reduction in plant height as a result of application of higher concentration of NAA which might have caused utilization of food material for development and production of more number of branches. The present study confirms the results of Gautam *et al*. (2006) in chrysanthemum. However, the foliar treatment of GA_3 300 ppm had recorded significantly maximum plant height (63.25 cm) at 60 DAT which was found to be statistically at par with the treatments GA_3 200 ppm (62.78 cm), NAA 100 ppm (62.11 cm), GA_3 100 ppm (60.41 cm) and GA_3 400 ppm (59.61 cm). However, minimum plant height (53.30 cm) was noted with the control treatment. This might be due to the fact that, an application of gibberellic acid at different concentrations and NAA at lower concentration *i.e.* 100 ppm might have enhanced the plant height by increasing the internodal length as a result of increased cell elongation and faster cell division. The results are in conformity with the findings of Swaroop *et al*. (2007) and Ramdevputra *et al*. (2009) in African marigold.

Table 1 : Influence of plant growth regulators on growth, flowering and seed yield of African marigold.

Treatments	Branches $plant^{-1}$	Plant height at 60 DAT (cm)	Days for first flower bud initiation	Days for 50 per cent flowering	Longevity of intact flower (days)	Seed yield $plot^{-1}$ (g)	Seed yield $hectare^{-1}$ (q)	Weight of seeds $flower^{-1}$ (g)
T_1 – Control (Water spray)	11.93	53.30	40.20	49.20	7.60	589.29	8.31	0.88
T_2 – GA_3 100 ppm	15.30	60.41	32.67	47.00	11.33	907.97	12.81	1.11
T_3 – GA_3 200 ppm	14.37	62.78	31.40	45.13	13.27	991.39	13.99	1.13
T_4 – GA_3 300 ppm	13.33	63.25	30.67	42.13	14.13	994.72	14.04	1.21
T_5 – GA_3 400 ppm	14.83	59.61	31.20	44.47	13.73	893.45	12.61	1.09
T_6 – NAA 100 ppm	15.50	62.11	33.93	45.23	13.47	975.44	13.76	1.11
T_7 – NAA 200 ppm	16.67	57.76	36.93	47.73	10.40	740.83	11.24	1.07
T_8 – NAA 300 ppm	17.30	56.67	37.53	47.87	9.80	736.85	10.54	1.00
T_9 – NAA 400 ppm	17.60	56.35	38.40	48.00	8.73	714.71	10.08	0.97
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m) ±	0.74	1.52	1.75	1.06	0.37	62.84	0.87	0.04
CD at 5%	2.23	4.60	5.26	3.20	1.13	188.42	2.60	0.12

DAT – Days after transplanting

Flowering

The foliar treatment of GA_3 300 ppm took significantly minimum period (30.67 days) for first flower bud initiation and 50 per cent flowering (42.13 days) and noticed maximum longevity of intact flower (14.13 days) and it was found statistically at par with the treatments of GA_3 400 ppm (31.20 days), GA_3 200 ppm (31.40 days), GA_3 100 ppm (32.67 days) and NAA 100 ppm (33.93 days). The foliar treatment of gibberellic acid might have stimulated and enhanced the vegetative growth by increasing photosynthesis and respiration with enhanced carbon-di-oxide fixation in the treated plants which would have associated with an early flowering. Further, gibberellin is quite effective in reducing the juvenile period of the plants. At the termination of juvenile phase, the shoot apical meristem might have converted into the flower premordia instead of producing leaves. This might have helped the flowers to last longer on the plant. The results obtained in the present investigation are in close agreement with the findings of Shinde *et al.* (2010) in chrysanthemum and Kumar *et al.* (2010) in African marigold.

Seed yield study

Significantly maximum seed yield $plot^{-1}$ (994.72 g) and seed yield ha^{-1} (14.04 q) and weight of seeds $flower^{-1}$ (1.21 g) were recorded with the foliar treatment of GA_3 300 ppm and it was found statistically at par with the treatments of GA_3 200 ppm (991.39 g, 13.99 q and 1.13 g, respectively), NAA 100 ppm (975.44 g, 13.76 q and 1.11 g, respectively), GA_3 100 ppm (907.97 g, 12.81 q and 1.11 g, respectively) and GA_3 400 ppm (893.45 g, 12.61 q and 1.09 g, respectively). However, significantly minimum seed yield $plot^{-1}$ and ha^{-1} (589.29 g and 8.31 q, respectively) and weight of seeds $flower^{-1}$ (0.88 g) were registered with the control treatment and it was found to be at par with the treatments NAA 400 ppm and NAA 300 ppm. An increase in the yield of African marigold seed $plot^{-1}$ and $hectare^{-1}$ might be due to the fact that, gibbrellic acid treated plants enhanced vegetative growth in terms of plant height which might have resulted into the production and accumulation of more photosynthates, which would have diverted to the sink resulting into production of higher yield of better quality seed in African marigold. These results are congruent with the results of Singh (2004) in French marigold, Sunitha *et al*. (2007) in African marigold and Sainath Uppar and Meena (2012) in chrysanthemum.

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