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Research Article

# Investigation of Different Levels Plant Growth Regulators and Pinching Treatments on Flowering and Yield Parameters of African Marigold (*Tagetes Erecta* L.)

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**Abstract**

The present investigation was conducted at Faculty of Agriculture, Annamalai University, Chidambaram to study the investigation of plant growth regulators and pinching on flowering and yield parameters of African marigold (*Tagetes erecta* L.). The flowering and yield parameters are significantly influenced due to growth regulator and pinching treatments. Of the varieties two hybrids tried, the mean days taken for flower appearance (41.72 days) and days to 50% flowering (51.72 days), maximum number of flowers (25.71), flower yield per plant (277.37g) and flower yield per hectare (20.51 t/ha) was observed in $V_1$ and it was followed by the $V_2$. The flower production, flower yield per plant and flower yield per hectare was found to maximum in $GA_3$150ppm followed by $GA_3$ 100ppm which recorded the value of (31.80, 404.52g, 30.02 t/ha and 29.73, 371.25g, 27.47t/ha), whereas control recorded the least value of (18.83, 161.44g and 11.94t/ha).

**Keywords:** Flower yield, marigold, pinching, PGR, GA3, NAA, Alar and MH

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## Introduction

African marigold (*Tagetes erecia* L.) is an important commercial flower in India belongs to family Asteraceae. There are two important cultivated species of Tagetes *i.e. Tagetes erecta* L. which is commonly known as African marigold, which is tall in habit and *Tagetes patula* L. is commonly known as French marigold and is dwarf in habit. It is very popular due to easy to grow and wider adaptability. In India, African marigold flowers are sold in the market as loose for making garland. Flowers are traditionally used in worship in homes and temples. Flowers also adorn the hair of women, particularly in South India and flowers are important for their economic uses, such as for cut blooms, for extraction of perfumes and other products. It is highly suitable for making flower beds in herbaceous border and also found ideal for newly planted shrubberies to provide colour and fill the gap in landscape. Both leaves and flowers possess medicinal values. Today with the advancement of technology, grower's main objectives in flowers crop is perfection in the form of plants in the characteristics of flowers and increase in the flower production. Growth regulators find their extensive use in ornamental crops for modifying their developmental process. Plant growth regulators play an important role in flower production, which in small amount promotes or inhibits or quantitatively modifies growth and development. $GA_3$, NAA, MH and Alar are very important plant growth regulators are now a day being tried for promote growth, flower yield and controlling growth and flowering of African marigold with a view to have compact plants and hasten or delay the flowering period. Gibberellic acid increased to be very effective in manipulating growth and flowering in African marigold [1, 2]. Naphthalene Acetic Acid is involved in cell elongation and rapid cell stimulation leading to bigger plants and ultimately enhanced yields [3]. Maleic hydrazide (MH) have been found to retard plant height by reducing intermodal length and also simultaneously it reduces the formation of lateral shoots thereby plant produces more number of flower bearing shoot in African marigold [4]. Alar may act as growth retardants and thereby inhibited biochemical processes resulting in retard plant height, number of nodes and internodal length, increase branching and delayed flowering in China aster [5]. Similarly by pinching, the terminal portion of shoots is removed enhancing earlier emergence of side branches and production of more number of good quality and uniform size flowers [6] in African marigold. Keeping this in view, the present study was initiated to investigate the effect of plant growth regulators and pinching on improvement of flowering in African marigold.

## Materials and Methods

An experiment was conducted during 2012-2013 at the floriculture and medicinal unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Chidambaram, Cuddalore district of Tamil Nadu, India. Recommended dose of NPK and other inputs were applied at appropriate time. The geographical location of the experimental site is situated at 11° 24′ North latitude and 79°41′ East longitudes at an altitude of ± 5.97 m above mean sea level. The mean maximum temperature is 31.7°C. The mean minimum temperature is 20.0°C. The average rainfall is 1394.4 mm of which 927.9 mm (66.7%) is received during North-East monsoon, 329.6 mm in South West monsoon and 126.7 mm (9.7%) as summer showers. The mean relative humidity is 78%. The treatments comprising $GA_3$ @ 50, 100 and 150ppm, NAA @ 50, 100 and 150ppm,MH @ 250, 500 and 750ppm, Alar @ 200, 400 and 600ppm and pinching with untreated control. These were applied as foliar spray to the respective plots as per treatment schedule in two doses at ten days after planting and twenty days after first spray and the pinching was done at twenty days after transplanting. This experiment was carried out in Factorial Randamized Block Design replicated thrice with 14 treatments having a plot size of 3 m x 1.35 m. The experimental material consisted of seedlings of African marigold (*Tagetes erecta* L.) hybrid Gold Benz Tall and Maxima yellow obtained from Hosur, Tamil Nadu. Thirty days old healthy uniform seedlings were transplanted in the main field at a distance of 30 cm x 45 cm. Two seedlings were planted per hill, later on thinned out to one. The important flowering and yield parameters *viz.,* days taken for flower appearance, days to fifty percent flowering, number of flowers per plant, flower yield per plant (g), and flower yield per hectare (tonnes) were recorded in five randomly selected and tagged plants per replication in each treatment.

## Results and Discussion

All the flowering and yield parameters were influenced significantly due to various plant growth regulators and pinching (**Table 1**). The experimental findings indicate that the earliest bud initiation and days to 50% flowering was observed with the application of $GA_3$ @ 150 ppm.

**Table 1** Effect of plant growth regulators and pinching on flowering attributes of African marigold

| Treatments | Days taken for flower appearance | Days to 50% flowering | Number of flowers per plant |
|---|---|---|---|
| V1 | 41.72 | 51.72 | 24.96 |
| V2 | 43.49 | 53.49 | 25.71 |
| SEd | 0.08 | 0.08 | 0.07 |
| CD (p=0.05) | 0.17 | 0.16 | 0.14 |
| T1 GA350 ppm | 38.93 | 54.1 | 27.5 |
| T2 GA3 100 ppm | 33.8 | 51.96 | 29.73 |
| T3 GA3 150 ppm | 31.9 | 50.86 | 31.8 |
| T4 NAA 50 ppm | 40.73 | 54.66 | 27.26 |
| T5 NAA 100 ppm | 36.76 | 52.83 | 28.5 |
| T6 NAA 150 ppm | 36.06 | 52.66 | 29.26 |
| T7 MH 250 ppm | 42.73 | 55.8 | 25.16 |
| T8 MH 500 ppm | 46.63 | 59.03 | 22.7 |
| T9 MH 750 ppm | 49.33 | 61.73 | 21.63 |
| T10 Alar 200 ppm | 41.8 | 58 | 25.8 |
| T11 Alar 400 ppm | 44.46 | 59.93 | 23.36 |
| T12 Alar 600 ppm | 48.53 | 62.96 | 22.4 |
| T13 Pinching | 53.53 | 66.03 | 20.8 |
| T14 Control | 51.3 | 64.93 | 18.83 |
| SEd | 0.23 | 0.22 | 0.18 |
| CD (p=0.05) | 0.47 | 0.44 | 0.37 |

The mean days taken for flower appearance and days to 50 % flowering (41.72 days and 51.72 days) was observed in $V_1$ and in the case of $V_2$ (43.49 days and 53.49 days) were observed. Of the varieties two hybrids tried,

the flower productions were maximum in $V_2$ which recorded the value of 25.71 numbers of flowers when compared to $V_1$ (24.96). Among the various two hybrid varieties, the flower yield per plant and flower yield per hectare was maximum in $V_1$ (Gold Benz Tall) with the value of (277.37 g and 20.57 t/ha) and it was followed by $V_2$ (Maxima Yellow) which recorded the value of (270.27 g and 19.96 t/ha). Gibberellins reduces juvenile period and with the termination of juvenile phase, the shoot apical meristem instead of producing leaves and branches start producing buds. Similar finding were also reported by Mithilesh Kumar *et al*. (2014) [4].

With regard to growth regulator and pinching application, the earliest flowering and least 50% flowering was observed in $T_3$ $GA_3$ @ 150 ppm (31.90 days and 50.86 days) and it was followed by $T_2$ $GA_3$ @ 150 ppm (33.80 days and 51.96 days) whereas in $T_{13}$ pinching took the maximum days for flower appearance and 50% flowering was observed in (53.53 days and 66.03 days). Early budding and flowering in $GA_3$ spray may be due to increase in the endogenous gibberellins level in the plants, as gibberellins are well known for inducing early budding and flowering in several crop plants. The results of first flower initiation and days taken for 50% flowering were comparable with the results obtained by Gupta and Dutta (2000) [7] and Padampriya and Chezhiyan (2002) [8] and Patel *et al*., (2010) [9] in chrysanthemum and Mithilesh Kumar *et al* (2014) [4] in marigold.

The data recorded on Maximum number flowers per plant were registered with the application of $T_3$ $GA_3$ @ 150 ppm followed by $T_2$ $GA_3$ @ 100 ppm (31.80 and 29.73) whereas in $T_{14}$ (Control) recorded the least number of flowers per plant (18.83). The enhancement in number of flowers per plant might be due to the production of large number of laterals at early stage of growth which had sufficient time to accumulate carbohydrate for proper flower bud differentiation due to enhanced reproductive efficiency and photosynthesis restrictive plant type. The results are in agreement with the findings of Sunitha *et al*. (2007) [6] in African marigold.

The present investigation shows (**Figures 1** and **2**) that the $GA_3$ treatment at various concentrations had marked on flower yield per plant and flower yield per hectare. The flower yield per plant and flower yield hectare$^{-1}$ were found to maximum in $T_3$ $GA_3$ @ 150ppm recorded 404.52g and 30.02 t/ha. and the next best treatment was $T_2$ GA3 @ 100 ppm which registered flower yield of 371.25 g 27.47 t/ha, whereas in $T_{14}$ Control recorded the least flowers yield of (161.44g and 11.94 tonnes). The increase in yield and yield parameters with $GA_3$ spray may be due to better crop growth, leaves and more number of flowers per plant and maximum fresh weight per flower thus ultimately increased the flower yield plant$^{-1}$. Further it can be ascribed due to better translocation of more metabolities from source to sink. The findings are accordance with Gupta and Dutta (2000) [7] Dahiya and Rana (2001) [10] and Padampriya and Chezhiyan (2002) [8] and Patel *et al*., (2010) [9] and Shinde *et al*., (2010) [11] in chrysanthemum and Mithilesh Kumar *et al* (2014) [4], Verma and Arha (2004) [12] in African marigold.

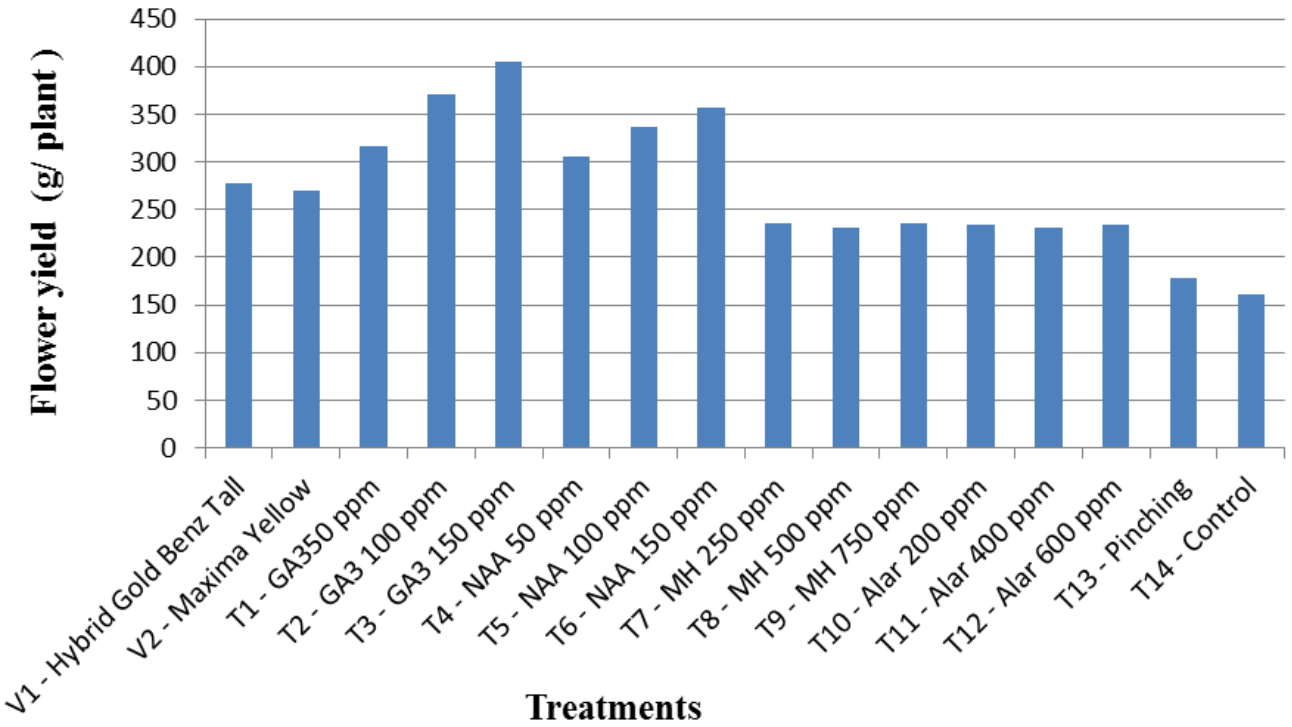


**Figure 1** Effect of plant growth regulators and pinching on flower yield per plant (g) of African marigold

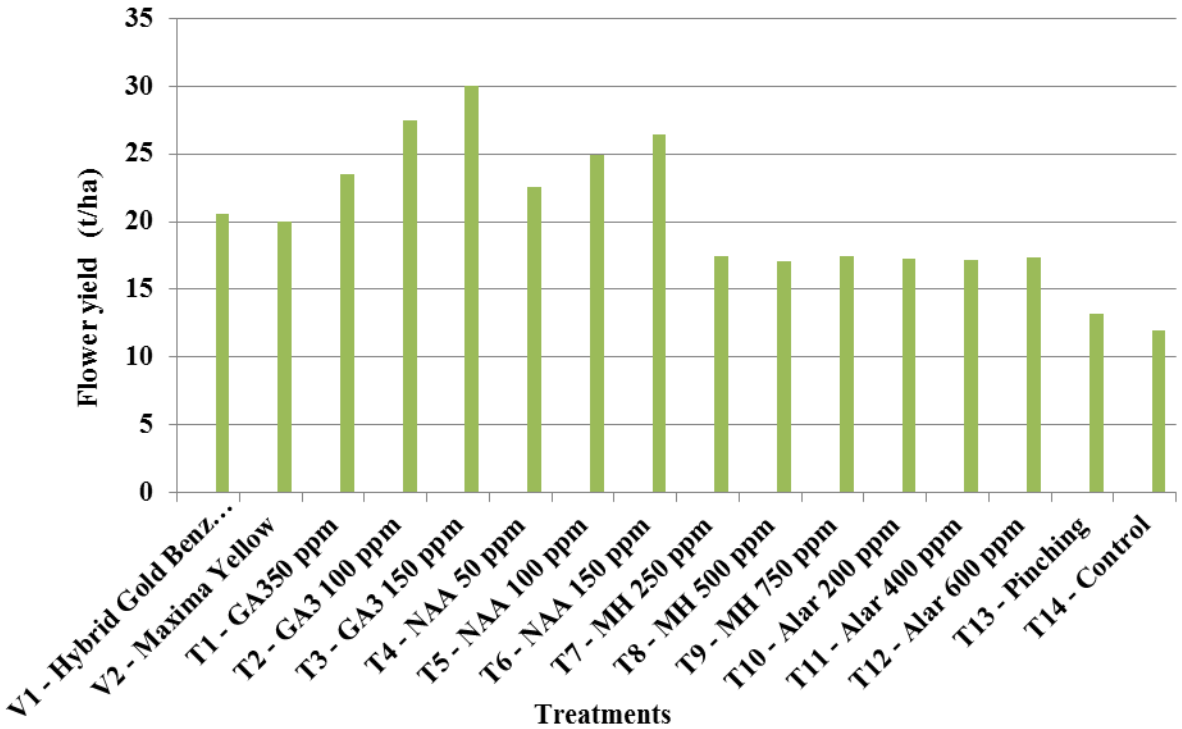


**Figure 2** Effect of plant growth regulators and pinching on flower yield per hectare (tonnes) of African marigold

## Conclusion

From the experiment it was revealed that the varieties $V_1$ (Gold Benz tall) performed better for all the yield characters than $V_2$ (Maxima yellow). From the economic point of view different flowering and yield characters like days taken for flower appearance, days to 50% flowering, number of flowers per plant, flower yield per plant and flower yield per hectare were found to be maximum from $GA_3$ treated plant at a concentration of 150 ppm as compared to other treatments.

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