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# Effect of Plant Growth Hormones on Growth and Flower Yield of African Marigold (*Tagetes erecta* L.)

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**A B S T R A C T**

African marigold (*Tagetes erecta* L.) is one among the important traditional loose flowers grown in India. It is grown for its spectacular flowers, brilliant colour, and delightful appearance, myriads of size, shapes and forms. Flowers are extensively used for making garlands, floral rangoli and decoration purpose and as loose flowers in one or other forms for religious offerings and social functions. Marigold growth and flowering can be altered through application of various growth regulators. Hence, an experiment was conducted to study the influence growth hormones in enhancing the growth and flower yield of African marigold in the farm of B. T. College, Madanapalle, Andhra Pradesh. The experiment was laid out in Factorial Randomized Block Design along with nine treatments and replicated thrice. The study comprising $GA_3$ @ 100 and 150 ppm, NAA @ 100 and 150 ppm, MH @ 500 and 750 ppm, Alar @ 300 and 400 ppm and pinching with untreated control. Results of the experiment revealed that the plant sprayed with of $GA_3$ @ 150ppm was found most effective as it registered the maximum plant height (69.09 cm), number of branches (15.80), leaf area (111.7 cm2) and diameter of fully opened flower (9.26 cm), number of flowers (31.83), single flower weight (11.54 g) and flower yield of 367.3 g per plant. Thus the present investigation clearly indicates that plant sprayed with of $GA_3$ at 150 ppm proved to be best treatment in improving the vegetative growth and flower quality in African marigold var. Pusa Basanti.

## Introduction

African marigold (*Tagetes erecta* L.) is one among the important traditional loose flowers grown in India. It is grown for its spectacular flowers, brilliant colour, and delightful appearance, myriads of size, shapes and forms. Flowers are extensively used for making garlands, floral rangoli and decoration purpose and as loose flowers in one or other forms for religious offerings and social functions. 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 repellant (Gopichand *et al.*, 2014). It is cultivated commercially in most parts of India. In India the commercial extraction of marigold carotenoids is done in

Cochin (Kerala), Hyderabad (Andhra Pradesh), Satyamangalam (Tamil Nadu) and Telagi near Harihar, Davanagera, Haveri and Kolar, Chikmagalur district and around Bangalore (Karnataka). The carotenoids are regularly exported to Mexico, Peru, USA, Spain, Japan, Turkey, Poland, Italy, Australia, Canada and Africa. Growth hormones are known to modify the growth and development of plants without causing any malformation. Their application have been an essential part of floriculture and utilization of growth substances constituted one of the most important advances in agro technology for improving the growth and quality parameters of flowers. The plant growth regulators have been used in floriculture to manipulate plant growth in a desired direction (Sharma *et al.,* 2001). In recent year's scientist have given due attention to the idea of regulating plant growth as third most important factor in improving the growth, yield and quality with the application of growth regulators in various ways. The experiment was carried out to know the effect of plant growth regulators on the growth and flower yield of African marigold var. Pusa Basanti.

## Materials and Methods

An experiment was conducted at the Horticulture farm of B. T. College, Madanapalle, Andhra Pradesh. The treatments comprising $GA_3$ @ 100 and 150 ppm, NAA @ 100 and 150 ppm, MH @ 500 and 750 ppm, Alar @ 300 and 400 ppm 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. Recommended dose of NPK and other inputs were applied at appropriate time. This experiment was carried out in Randomized Block Design replicated thrice with 9 treatments. The experimental material consisted of seedlings of African marigold (*Tagetes erecta* L.) Pusa Basanti. Thirty days old healthy uniform seedlings were transplanted in the main field at a distance of 45 x 35 cm. Two seedlings were planted per hill, later on thinned out to one. The important plant growth parameters *viz*. plant height, number of branches-1, leaf area ($cm^2$), flower diameter (cm), number of flowers, single flower weight (g) and flower yield were recorded in five randomly selected and tagged plants per replication in each treatment. The obtained data recorded were subjected to statistical analysis by method suggested by Panse and Sukhatme (1978).

## Results and Discussion

Results of the experiment revealed significant differences with regard to plant height (cm), number of branches $plant^{-1}$, leaf area ($cm^2$) at application of different plant growth regulators. Maximum plant height (67.87 cm) was observed under the treatment T2 ($GA_3$ @150 ppm) which is closely followed by the treatment T1 ($GA_3$ @100 ppm) with 64.89 cm. However the control plants showed a lowest plant height of 54.32 cm.

The data on number of branches (14.58) recorded maximum values under the treatment T2 ($GA_3$@ 150 ppm) followed by 13.61 branches in the treatment T1 ($GA_3$@100 ppm). The least number of branches (7.81) was recorded under untreated control (T9).

Maximum leaf area (108.83 cm2) was recorded under the treatment T2 ($GA_3$ @150 ppm) and the minimum leaf area (60.81 cm2) was recorded under the control (T9). Increase in plant height, number of branches and leaf area due to the application of $GA_3$ was due to its effect on stem elongation by increasing cell elongation in sub-apical meristem.

**Table.1** Effect of growth regulators on growth and flower yield of African Marigold Var. Pusa Basanti

| Treatments | Plant height (cm) | No. of branches plant$^{-1}$ | Leaf area (cm$^2$) | Flower diameter (cm) | Number of flowers per plant | Single flower weight (g) | Flower yield per plant (g) |
|---|---|---|---|---|---|---|---|
| T1- GA3 100 ppm | 64.89 | 13.61 | 102.53 | 8.87 | 28.6 | 10.48 | 328.02 |
| T2- GA3 150 ppm | 67.87 | 14.58 | 108.83 | 8.98 | 30.18 | 10.78 | 355.32 |
| T3- NAA 100 ppm | 60.89 | 12.78 | 94.91 | 8.26 | 25.87 | 9.79 | 278.32 |
| T4- NAA 150 ppm | 62.46 | 13.25 | 101.13 | 8.67 | 25.94 | 10.18 | 289.82 |
| T5- MH 500 ppm | 48.07 | 9.65 | 77.21 | 7.09 | 24.28 | 7.78 | 209.42 |
| T6- MH 750 ppm | 45.19 | 9.11 | 85.11 | 6.6 | 23.72 | 8.88 | 232.62 |
| T7- Alar 300 ppm | 52.89 | 11.6 | 69.18 | 7.33 | 25.29 | 7.06 | 198.72 |
| T8- Alar 400 ppm | 46.09 | 9.45 | 81.11 | 6.26 | 25.96 | 8.46 | 242.62 |
| T9- Control | 54.32 | 7.81 | 60.81 | 5.99 | 25.97 | 6.55 | 189.92 |
| SE.d | 0.06 | 0.08 | 0.90 | 0.02 | 0.49 | 0.05 | 0.88 |
| CD (p=0.05) | 0.12 | 0.17 | 1.80 | 0.04 | 0.98 | 0.09 | 1.78 |

Stimulation of branching may be due to increase in number of nodes on main axis and consequently increase in number of dormant buds from where primary branches originate. Similar results were also reported by Swaroop *et al.,* (2007), Sunitha *et al.,* (2007) and Amit Kumar *et al.,* (2011) in African marigold. The present findings indicate that the application of $GA_3$ at various levels had highly significant influence on plant height, number of branches plant$^{-1}$ and leaf area (cm$^2$) differed significantly.

Contradictorily, the plants applied with growth retardants showed reduction in plant height (48.07 cm and 45.19 cm in T5 MH@500 ppm and T6-MH@750 ppm respectively). Similarly, the plants sprayed with Alar @300 and 400 ppm showed reduced plant height (46.09 cm and 52.89 cm under T7 and T8 respectively. The reduction in plant may be due to suppression of apical growth by the retardants which in turn prepare the plant to induce flowering than producing more vegetative parts. As the apical dominance is removed usually the plant itself adjusts to encourage the growth of auxiliary buds, which may be converted into flowering buds. Similar effects were reported by Sunitha *et al.,* (2007), Joicin samitha (2007) and Maharnor *et al.,* (2011) in African marigold. The data presented in with respect to flowering parameters revealed significant differences among the hormones sprayed. Maximum flower diameter (8.98 cm) was recorded under the treatment T2 ($GA_3$ @150 ppm) which is followed by T1 ($GA_3$ @100 ppm) with 8.87 cm. The lowest flower diameter was found in T9 Control (5.99 cm). The data on number of flowers showed maximum values (30.18) from the treatment T2 ($GA_3$ @150 ppm) which is followed by the treatment T1 ($GA_3$ @100 ppm) with 28.61. The minimum number of flowers (25.97) was recorded under T9 (Control). Highest flower weight (10.78 g) was obtained from those plants sprayed with $GA_3$ @150 ppm (T2). This is flowed by the treatment T1 ($GA_3$ @100 ppm) with 10.48 g. The treatment T2 produced the maximum flower yield of 355.32 g which is followed by the treatment T1($GA_3$ @100 ppm) with 3328.02 g. However, the control plants produced only 189.92 g. Therefore an increase in diameter of flower, number of flowers,

single flower weight and flower yield obtained with the application of GA3 @ 150 ppm might be due to increase in auxin activity in the floral buds. The gibberellins are well known for its promoter effects on cell division and cell elongation. Since, the alar is an anti auxins and also possibly anti gibberellins too would have reduced the flower size and numbers. Similar results were also reported by Girwani *et al.,* (1990), Gowda and Jayanthi (1991) in Marigold, Vijaiananth and Anburani (2010) and Kumar and Haripriya (2010) in Nerium and shinde *et al.,* 2010 in chrysanthemum and Ragaa and Taha (2012) in Iris plants. Thus the present investigation clearly indicates that plant sprayed with of $GA_3$ at 150ppm proved to be best treatment in improving the vegetative growth and flower quality in African marigold var. Pusa Basanti.

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