Effect of Gibberellic Acid and Cycocel on Vegetative Growth, Flowering, Yield and Quality Attributes of African Marigold (*Tagetes erecta* L.)

SUMMARY

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Summary

Marigolds (*Tagetes erecta* L.) are one of the annual flowers easiest to cultivate and have a wide adaptability to different agro-climatic conditions. The plants with their attractive flower colors bloom for a considerably long period and the flowers remarkably well when cut. Their aesthetic value, they are important for their economic uses, such as for cut blooms and for extracting perfumes and other products. Mainly two types are commercially grown in India *viz*., African marigold (*Tagetes erecta* L., 2n = 24) and French marigold (*Tagetes patula* L., 2n = 48). It is one of the oldest cultivated flowering plants, comes under the ornamental being very popular in tropical and sub-tropical countries as a garden plant for beautification. *Tagetes erecta* is commonly known as African marigold. The plant of *Tagetes erecta* is hardy annual, tall in nature 90 to 95 cm height, erect and more branching. Leaf is pinnate, divided and leaf lets are lanceolate and serrated. It has large sized flower. Flower colours are yellow and orange in various shades *i.e.* light yellow, golden yellow, bright yellow, deep orange, golden yellow and bright orange. The florets are quilled or two lipped.

There is a great increase in demand of floricultural products with increasing income and globalization of economy. Netherlands, Italy, Germany and Japan have strong tradition for growing and consumption of flowers. However new production centers are developing in Latin America, Kenya, South Africa, Israel, India. In terms of value: Germany (30.3%), USA (16.8%), Uk (9.7%), France (9.7%), and the Netherlands (8.4%) are leading countries. Major exporting countries are the Netherlands (56.5%), Columbia (14.1%) and Israel (4.2%). Kenya, Thailand, Zimbabwe, Ecuador and India with about 0.3% share of World Trade of cut flower exports (**Indian horticulture val. 48, No. 1, April-June-2003).** Netherlands, Italy, Germany and Japan have strong tradition for growing and consumption of flowers.

Hormone can be defined as a substance produced one part of any organism but later on transferred to another part of the same organism where it affects a specific physiological action. The term 'growth regulator' is applied to organic compounds, other than plant nutrients, which when used in minute quantities can either inhibit, stimulate, or alter growth. In this group are included auxins, gibberellins, cytokinins, abscisic acid, and ethylene. The major area where plant growth regulators are used in floriculture are plant propagation, plant height control, regulation of flowering, a prolonging the life of cut blooms, besides some other minor uses. In modern days, city dwellers living in flats can hardly afford to grow tall pants because of lack of space. The GA_3 regulation of growth itself is involved with both cell division and effects (**Sachs *et al*., 1958)** and cell enlargement without cell division (**Haber and Lopold, 1960 and Haber *et al*., 1969).** On the other hand Cycocel (2-chloroethyl-trimethyl-ammonium chloride) is a potent growth retardant. Cycocel is a synthetic growth retardant and Cycocel (CCC) retarded stem elongation by preventing cell division in sub-apical meristem, usually without similarly affecting the apical meristem. Cycocel was found to influence very significantly the vegetative growth of plants, without affecting the flower bud initiation, emergence of flowering and duration of flowering cycocel increase the number of branching, number of leaves, number of flowers and flower yield per plant but reduce the mean weight of flower.

Therefore keeping in view these facts, the present investigation aims to achieve the following objective.

1. To assess the effect of Gibberellic acid and Cycocel on vegetative growth of African marigold.
2. To find out the effect of Gibberellic acid and Cycocel on flowering of African marigold.
3. To estimate the flower yield of African marigold influenced by the spraying of Gibberellic acid and Cycocel.

4. To evaluate the effect of Gibberellic acid and Cycocel on quality attributes of African marigold.

The present investigation was carried out at Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University),Vidya-Vihar, Rae Bareli Road, Lucknow 226025 (U.P.), India during the 2016-17.The Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow is situated at elevation of 111 meter above mean sea level in the subtropical tracts of Central U.P. at 26^0-56^0 North latitude.

Field preparation was done by ploughing the field with mould board plough once, followed by leveling and weeding manually. Harrowing was done to break the clods followed by criss-cross ploughing by cultivator, then the field was pulverized by rotavator. During harrowing, well rotten FYM was incorporated in the soil. The experiment was laid out with the help of measuring tape, rope and bamboo pegs. The beds were prepared according to the lay out plan. A total 33 plots were made with a size 1.80 x 1.20 m. of each plot.1m wide drainage channel were made between the two replications. Each plot contains 4 row (rows were raised by 15 cm from main field) and plants were planted at distance of 45 cm x 30cm (4 plant in each row),accommodated 16plants in each plot. Marigold seedlings were transplanted after 30 days of sowing. Healthy seedlings with uniform growth having 3-5 leaf were selected for transplanting. The seedlings were transplanted in experimental field on 10 February 2017 and immediately after transplanting, light irrigation was done. Transplanting was done in the evening hours to avoid exposure to sunlight and to allow better establishment in cool hours of night with the help of a sprayer, the growth regulators were sprayed till the runoff stage during the afternoon on the plants. First spraying was undertaken at 20 DAT followed by 40 DAT.

An area of 15.2 m x 7.4 m size was divided into 33 plots having the size of 1.80 x 1.20 m and arranged in the three replications of 11 plots. The

experiment was laid out in RBD under 11 treatments. The salient feature of the experiment is summarized below.

- The maximum plant height was noticed by the application of GA_3 at 400 ppm under the treatment (T_5) followed by treatments (T_4) GA_3 at 300 ppm.The minimum plant height was noticed under the treatment (T_{10}) Cycocel at 2500 ppm.

- The maximum number of branches per plant was recorded under treatment (T_5) by the application GA_3 at 400 ppm, followed by treatments (T_4) GA_3 at 300 ppm. The minimum number of branches was registered under treatment control (T_0).

- The maximum number of leaves per branch was recorded under treatment (T_5) GA_3 at 400 ppm, followed by treatments (T_4) GA_3 at 300 ppm.The minimum number of leaves per branch was recorded under treatment control (T_0).

- The maximum number of leaves per plant was recorded under treatment (T_5) by the application GA_3 at 400 ppm, followed by treatments (T_4) GA_3 at 300 ppm. The minimum number of leaves was recorded under treatment control (T_0).

- The minimum days taken to first bud appearance was registered under the treatment (T_{10}) Cycocel at 2500 ppm followed by (T_9) cycocel at 2000 ppm. The treatment (T_0) showed late bud appearance.

- Days taken to first flowering was registered under the treatment (T_{10}) Cycocel at 2500 ppm followed by (T_9) cycocel at 2000 ppm. While the treatment (T_0) recorded maximum time for first flowering.

- The treatment (T_{10}) Cycocel at 2500 ppm recorded least days for 50 per cent flowering and followed by (T_9) cycocel at 2000 ppm. The treatment (T_0) recorded maximum days for 50 per cent flowering.

- The first flowering picking recorded under the treatment (T_{10}) Cycocel at 2500 ppm followed by (T_9) cycocel at 2000 ppm. While the treatment (T_0) recorded maximum time for first flowering.

- Maximum flower diameter was recorded under the treatment (T_5) GA_3 at 400 ppm followed by treatments (T_4) GA_3 at 300 ppm Minimum flower diameter was recorded treatment (T_0).

- The treatment (T_{10}) Cycocel at 2500 ppm had maximum duration of flowering followed by (T_9) Cycocel at 2000 ppm by while minimum duration of flowering was observed under the treatment (T_0) control.

- The maximum number of flowers per plant was recorded under the treatment (T_5) GA_3 at 400 ppm followed by treatment (T_4) GA_3 at 300 ppm., whereas, minimum number flowers per plant was registered under (T_0).

- The maximum mean weight of flower was observed under the treatment (T_5) GA_3 at 400 ppm followed by treatments (T_4) GA_3 at 300 ppm. However, minimum fresh flower weight was recorded treatment (T_0) control. .

- The maximum flower yield pr plant was observed under the treatment (T_5) GA_3 at 400 ppm followed by treatment (T_4) GA_3 at 300 ppm. However, minimum weight of flower per plant was recorded treatment (T_0) control.

- The maximum flower yield per plot was observed under the treatment (T_5) GA_3 at 400 ppm followed by treatment (T_4) GA_3 at 300 ppm. However, minimum flower yield per plot was recorded treatment (T_0).

- The maximum flower yield per hectare was observed under the treatment (T_5) GA_3 at 400 ppm, followed by treatment (T_4) GA_3 at 300 ppm. However, minimum fresh yield per hectare was recorded treatment (T_0).

- The maximum shelf life of flowers was recorded under the treatment (T_5) GA_3 at 400 ppm, followed by treatments (T_4) GA_3 at 300 ppm. The lowest shelf life of flowers was recorded treatment (T_0).

- The maximum moisture content in flower was recorded (T_5) GA_3 at 400 ppm, followed by treatments (T_4) GA_3 at 300 ppm. Minimum moisture content in flower was recorded treatment (T_0).

On the basic of above result obtained in the present investigation, it was concluded that the maximum plant height at 30, 45, 60, 75 and 90 days after planting number of branches per plant, number of leaves per branch, number of leaves per plant, diameter of flower (cm), number of flower per plant, mean weight of flower (g), Weight of flower per plant (g), flower yield per plot (kg), yield per hectare(t), shelf life of flower (days), and moisture content in flower (%) recorded from T_5 treatment application of GA_3 at 400 ppm, followed by T_4 treatment application of GA_3 at 300 ppm obtained better response of marigold over the control treatment T_0.Treatment T_0 (control conditiopn) significantly increase days taken to first bud appearance, days taken to first flowering, days taken to 50% flowering, and days taken to first flower picking followed by treatment T_1 (GA_3 at 50 ppm) than significantly increase over the treatment T_{10} (Cycocel at 2500 ppm). Application of different growth regulators significantly influenced maximum duration of flowering the treatment T_{10} (Cycocel at 2500 ppm) followed by treatment T_9 (Cycocel at 2000 ppm). While, minimum flowering period was observed under the treatment (T_0) normal condition.