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# Effect of different plant bio-regulators on growth, flowering and corm production of gladiolus cv. friendship

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**Abstract**
In order to investigate the effect of different plant bio-regulators on growth, flowering and corm production of gladiolus cv. Friendship, the present experiment was carried out in the Department of Horticulture, Nandini Nagar PG College Nawabganj, Gonda (U.P.)- 271303, India, during 2019-20.The experiment comprised of three levels each of $GA_3$, (75, 100 and 125 ppm) NAA (50, 75 and 100 ppm) and Kinetin (50, 75 and 100 ppm) including a control, which were tested in randomized block design with three replications. The corms of uniform size were soaked in required concentration of plant bio-regulators thoroughly for twenty-four hours. The planting of corms was done at a distance of 30 x 30 cm and about 5 cm deep in the bed of 150 X 60 cm size accommodating 10 corms per bed. From the experiment it is evident that earliest sprouting of corms (12.95 days), maximum height of plants (88.74 cm), length of rachis (52.52 cm), spike length (84.72 cm); number (16.12) and size of floret (8.71cm length and 5.66 cm width), number and weight of corm (2.20 and 70.33 g) and cormels (27.45 g) with more diameter of corms (8.20 cm) and more longevity of spike (25.50 days) were observed from the corms soaked in 125 ppm $GA_3$ solution, whereas corms soaked in 100 ppm $GA_3$ solution produced more number of leaves (12.41) with maximum size (62.90 cm length and 3.10 cm width). Significantly minimum number of days for emergence of spike (72.66 days) and opening of first florets (81.66 days) were also recorded in $GA_3$ 125 ppm-soaked corms as compared to control.

**Keywords:** gladiolus, gibberellic acid, NAA, kinetin, growth, flowering, corm production

## Introduction
Gladiolus is a prominent bulbous lower crop. It is popularly known as "Queen of the bulbous flowers" because of its attractive spikes, having florets of different colours and with longer shelf-life. Gibberellic acid was reported to be very effective in increasing growth, flowering and corm production of gladiolus. It modifies the growth and development of the plant including corm and cormels production at optimum concentration. The plant bio-regulators play an important role and are being used for breaking dormancy and production of quality corm and spikes in gladiolus (Bhattacharjee, 1984) [3].

## Material and Methods
The present experiment was carried out in the Department of Horticulture, Nandini Nagar PG College Nawabganj, Gonda (U.P.) - 271303, India, during 2019-20. There were in all ten treatments *viz.*, three levels each of $GA_3$ (75, 100 and 125 ppm), NAA (50, 75 and 100 ppm) and Kinetin (50, 75 and 100 ppm) including a control, replicated thrice in randomized block design. The corms of uniform size were soaked in required concentration of plant bio-regulators thoroughly for twenty-four hours. The planting of corms was done at a distance of 30 x 30 cm and about 5 cm deep in the bed of 150 X 60 cm size accommodating 10 corms per bed. A basal dose of 12 kg/ $m^2$ FYM, 200 g/ $m^2$ $P_2O_5$ and 300 g/$m^2$ $K_2O$ was applied and 50 g N/ $m^2$ were given in three equal split doses *i.e.* first at the time of soil preparation, secondly at six leaf stage and last at the time of spike emergence. Uniform and standard cultural practices were followed. Data on sprouting of corms, vegetative growth, flowering and corm production attributes were recorded and analyzed statistically.

## Results and Discussion
The vegetative growth attributes of gladiolus plants judged in terms of sprouting of corms, number of sprouts per corm, height of plant, number and size of leaves in the present investigations were boosted to the maximum under the influence of soaking treatments of $GA_3$

(Table-1). The plants under control exhibited the poorest values in all the traits. The earliest sprouting of corms (12.95 days) and maximum height of plant (88.74 cm) was noted in treatment with $GA_3$ 125 ppm followed by $GA_3$ 100 ppm (13.37 days and 86.93 cm) and $GA_3$ 100 ppm (13.79 days and 88.75 cm, respectively) concentration. The early sprouting and increase in plant height with $GA_3$ treatment may be attributed to enhanced cell division in shoot tip and cell elongation. The present results are in conformity with the findings of Kumar *et al.* (1978) [7] in Dahlia; Jana and Biswas (1982) [6] in Tuberose, Pal and Das (1990) [10] in Lilium and Tripathi *et al.* (2009) [13] in gladiolus.

The number and size of leaves are important parameters which largely influence the general growth and floral attributes of plants. The soaking treatment of $GA_3$ produced the maximum number and size of leaves over control (Table 1). Plants treated with $GA_3$ at 100 ppm produced significantly more number of leaves (12.41) with maximum length (62.90 cm) and width (3.10 cm) closely followed by $GA_3$ at 175 ppm. All other treatments of NAA and Kinetin were statistically at par in this respect but superior to control, in which the minimum number (11.08) and size (58.99 and 2.82 cm, respectively) of leaves were produced. These findings are in agreement with the reports of Jana and Biswas (1982) [6] in Tuberose, Bhattacharjee (1984) [3] in Gladiolus and Pal and Das (1990) [10] in Lilium.

Data presented in Table 1, clearly revealed that the number of days required for the emergence of spike and opening of first floret was minimum with the concentration of $GA_3$ at 125 ppm (72.66 and 81.66 days) followed by $GA_3$ at 100 ppm (73.74 and 82.87 days) and $GA_3$ at 100 ppm (74.91 and 84.08 days, respectively). Late emergence of spike and opening of first floret was recorded in case of the control (83.41 and 94.28 days). In general, $GA_3$ hastens early flowering (Pal and Das, 1990) [10]. The possible reason for earliness in flowering as well as spike emergence might be due to early primordial development, cell differentiation and more vegetative growth and accumulation of enough photosynthates required for reproductive phase (Ginzburg, 1974) [5].

Gladiolus is mostly grown for spikes; therefore, the length of rachis and spike both at the opening of the floret as well as at full bloom stage are very important factors governing the value of the spikes (Table 2). In the present investigations, soaking treatments with $GA_3$ proved most effective in increasing the length of rachis as well as spikes. The maximum length of rachis (52.25 cm) and spike (84.72 cm) was recorded in the corms soaked with $GA_3$ at 125 ppm at flower openings as well as at full bloom stage. Corms treated with Kinetin did not exert significant influence on length of spike but increased the length of rachis significantly over control (46.49 and 80.06 cm, respectively). These findings are in conformity with the report of Dual *et al.* (1984) [4], Mukhopadhyaya and Bankar (1986) [8] Tripathi *et al.* (2009) [13] in gladiolus.

The number, length and width of florets in the $GA_3$ (125 ppm) treated corms were maximum among all the treatments (Table 2). It produced 16.12 numbers of floret of 8.71cm length and 5.66 cm of width, whereas plants under control produced 13.24 florets of 7.56 cm length and 4.86 cm width. The number, length and width of florets under NAA and Kinetin treatments were also found significantly higher as compared to control, but statistically at par with each other. These results are in agreement with the findings of Dual *et al.* (1984) [4] Tripathi *et al.* (2009) [13] in Gladiolus and Mukhopadhyaya and Bankar (1983) [9] in Tuberose. The increase in number and size of florets with $GA_3$ treatments might be due to its appropriate action on opening of florets and higher rates of cell multiplication.

Longevity of spike in gladiolus is one of the most important parameters which influence the quality during transport of flowers. In the present investigation spikes under $GA_3$ at 125 ppm treatment were significantly superior followed by $GA_3$ 100 ppm and Kinetin 100 ppm (Table 2), expressing average longevity of 25.50, 23.83 and 23.50 days, respectively. The plants under control showed minimum longevity of spike (15.50 days).There is a special separation of the site of stimulation and the site of response. The buds do not perceive the stimulation for flowering. This is in complete agreements with reports of Bhattacharjee (1984) [3], Dual *et al.* (1984) [4] and Tripathi *et al.* (2009) [13] in Gladiolus as well as Kumar *et al.* (1978) [7] in Dahlia.

Data from Table 2 clearly reveals that all concentrations of gibberellic acid exihibited significant effect on all characters pertaining to corm and cormels production. Number of corm and cormels per plant are the most important characters which ultimately affect the total yield per plant. The maximum number of corms (2.20) and cormels (27.45) per plant was obtained in $GA_3$ at 125 ppm. All the treatments of NAA and Kinetin are statistically at par with each other. Arora *et al.* (1992) [1] and Ravidas *et al.* (2002) [11] also reported that gibberellic acid application increased corm and cormels production in gladiolus. The increase in number of corm and cormels production might be due to the increased height and number of leaves, which ultimately synthesized maximum carbohydrate which was translocated to the corms for storage.

The diameter of corm under $GA_3$ 125 ppm was significantly greater (8.20 cm) than the control (6.48 cm) but all the $GA_3$ treatments were statistically at par (Table 2). Similar was the case with NAA and Kinetin. In all the three bio-regulators, the diameter of corm increased with the increasing dose. These results are in agreement with those of Roychoudhury (1989) and Tripathi *et al.* (2009) [12, 13] in Gladiolus, who observed increased diameter of corm of gladiolus by $GA_3$ application. Bhattacharjee (1984) [3] in Gladiolus and Bhattacharjee (1983) [2] in Lilimum also noted similar results.

Weight of corms and cormels was significantly higher under $GA_3$ at 125 ppm (70.33 and 27.45 g) followed by $GA_3$ at 100 ppm (67.00 and 14.49 g, respectively) as compared to rest of the treatments (Table 2). The minimum corms and cormels weight (55.00 and 17.58 g, respectively) was recorded under control. All the levels of NAA and Kinetin also produced significantly higher weight of corm and cormels. The present findings are in accordance with those of Bhattacharjee (1984) [3], Mukhopadhyaya and Bankar (1983) [9] and Tripathi *et al.* (2009) [13] in Gladiolus.

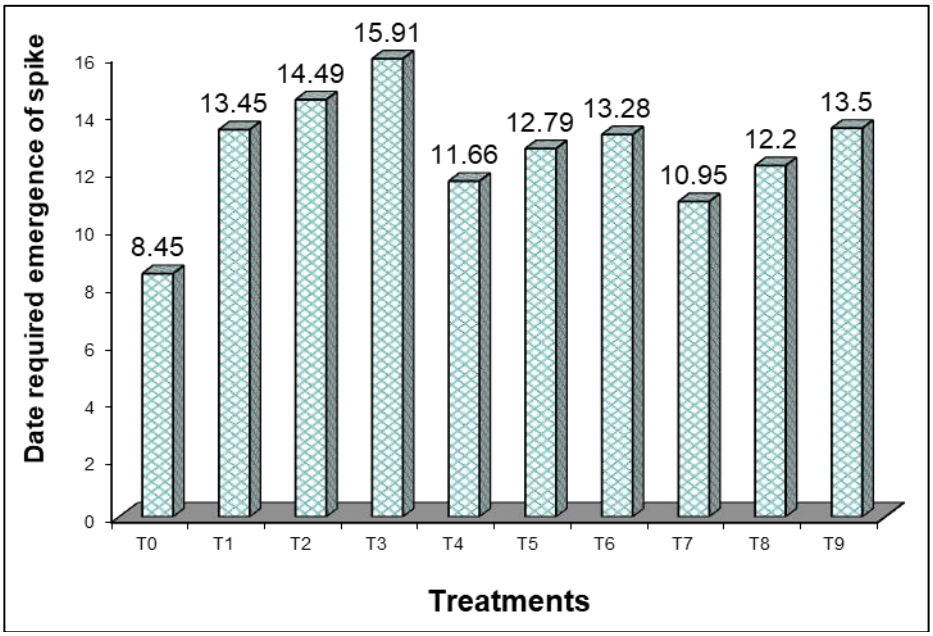


**Fig 1:** Effect of different plant bio-regulators on days required for spike emergence

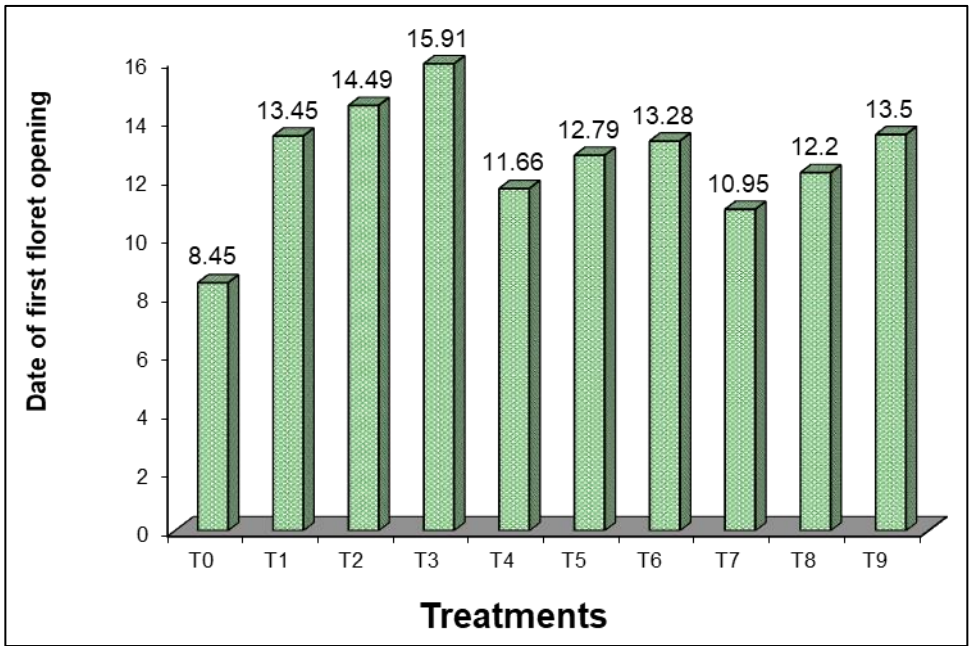


**Fig 2:** Effect of different plant bio-regulatore on days required for opening of the first floret

**Table 1:** Effect of different plant bio-regulators on sprouting and vegetative growth parameters of gladiolus cv. Friendship

| Treatments | Days to sprouting (days) | No. of sprouts / corm | Height of plant (cm) | No. of leaves | Length of leaves (cm) | Width of leaves (cm) |
|---|---|---|---|---|---|---|
| Control | 17.20 | 1.41 | 79.46 | 11.08 | 58.99 | 2.82 |
| $GA_3$ 75 ppm | 13.79 | 1.45 | 85.78 | 12.25 | 61.85 | 3.05 |
| $GA_3$ 100 ppm | 13.37 | 1.37 | 86.93 | 12.41 | 62.90 | 3.10 |
| $GA_3$ 125 ppm | 12.95 | 1.33 | 88.74 | 11.99 | 60.97 | 3.03 |
| NAA 50 ppm | 14.95 | 2.12 | 84.33 | 11.50 | 60.12 | 3.26 |
| NAA 75 ppm | 14.54 | 2.12 | 83.20 | 11.70 | 60.28 | 2.99 |
| NAA 100 ppm | 14.49 | 2.04 | 84.47 | 11.58 | 60.07 | 2.94 |
| Kinetin 50 ppm | 15.33 | 1.58 | 82.02 | 11.45 | 59.80 | 2.99 |
| Kinetin 75 ppm | 15.37 | 1.45 | 81.76 | 11.41 | 59.58 | 3.10 |
| Kinetin 100 ppm | 15.16 | 1.29 | 81.74 | 11.33 | 59.89 | 3.05 |
| S.E.± | 0.53 | 0.23 | 0.94 | 0.28 | 0.87 | 0.12 |
| C.D. at 5% | 1.12 | 0.48 | 1.98 | 0.59 | 1.84 | 0.26 |

**Table 2:** Effect of different plant bio-regulators on flowering, corms and cormels production in gladiolus cv. Friendship

| Treatments | Length of rachis (cm) | Length of spike (cm) | No. of florets per spike | Length of floret (cm) | Width of floret (cm) | Longevity of spike (days) | No. of Corms per plant | Diameter of corm (cm) | Weight of corm (g) | Number of cormels per plant | Weight of cormels per plant (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 46.49 | 80.06 | 13.24 | 7.56 | 4.68 | 15.50 | 1.37 | 6.48 | 55.00 | 17.58 | 8.45 |
| $GA_3$ 75ppm | 51.24 | 83.70 | 15.58 | 8.18 | 5.33 | 22.00 | 2.12 | 7.65 | 64.60 | 23.20 | 13.45 |
| $GA_3$ 100 ppm | 51.77 | 84.28 | 15.54 | 8.36 | 5.43 | 23.83 | 2.16 | 7.85 | 67.00 | 25.37 | 14.49 |
| $GA_3$ 125 ppm | 52.25 | 84.77 | 16.12 | 8.71 | 5.66 | 25.50 | 2.20 | 8.20 | 70.33 | 27.45 | 15.91 |
| NAA 50 ppm | 48.97 | 82.95 | 15.12 | 8.06 | 5.15 | 21.16 | 1.49 | 7.26 | 61.33 | 20.79 | 11.66 |
| NAA 75 ppm | 49.68 | 83.57 | 15.45 | 8.03 | 5.21 | 22.33 | 1.54 | 7.45 | 62.50 | 21.99 | 12.79 |
| NAA 100 ppm | 50.30 | 83.72 | 14.91 | 8.21 | 5.40 | 23.33 | 1.62 | 7.61 | 63.00 | 23.87 | 13.28 |
| Kinetin 50 ppm | 49.24 | 82.97 | 14.91 | 7.88 | 5.11 | 20.83 | 1.41 | 7.48 | 62.16 | 19.79 | 10.95 |
| Kinetin 75 ppm | 48.72 | 82.55 | 15.12 | 7.98 | 5.26 | 21.83 | 1.50 | 7.66 | 63.83 | 21.62 | 12.20 |
| Kinetin 100 ppm | 49.56 | 82.84 | 15.41 | 8.11 | 5.38 | 23.50 | 1.62 | 7.71 | 64.66 | 23.33 | 13.50 |
| S.E.± | 1.10 | 1.23 | 0.50 | 0.07 | 0.09 | 0.76 | 0.22 | 0.13 | 1.13 | 0.53 | 0.26 |
| C.D. at 5% | 2.31 | 2.60 | 1.05 | 0.15 | 0.20 | 1.59 | 0.48 | 0.27 | 2.39 | 1.12 | 0.54 |

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