*Int.J.Curr.Microbiol.App.Sci* (2018) Special Issue-7: 4036-4045

*International Journal of Current Microbiology and Applied Sciences*
*ISSN: 2319-7706* **Special Issue-7 pp. 4036-4045**
Journal homepage: http://www.ijcmas.com

**Original Research Article**

# To Assess the Effect of $GA_3$ on Growth, Flowering and Quality of Gladiolus (*Gladiolus grandifloras* L.)

**Khiromani Nag*, Akhilesh Jagre and Aditya Kumar**

Department of Agriculture Science and Technology Assistant Professor AKS University Satna.
**Corresponding author*

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

A field experiment was conducted to study the "To assess the effect of $GA_3$ on growth, flowering and quality of gladiolus(*Gladiolus grandifloras L.*)".The Cultivar Snow Princess, during the year 2015-2016 at the Department of Horticulture, Satna.The experiment was laid out in Factorial Randomized Block Design with three replications and treatments viz. ($T_1$) $S_1G_1$ = 30 x 15cm + GA3 50ppm, ($T_2$) $S_1G_2$ = 30 x 15cm + $GA_3$ 100ppm, ($T_3$) $S_1G_3$ = 30 x 15cm + $GA_3$ 150ppm, ($T_4$) $S_2G_1$ = 30 x 20cm + $GA_3$ 50ppm ($T_5$) $S_2G_2$ = 30 x 20cm + $GA_3$ 100ppm ($T_6$) $S_2G_3$ = 30 x 20cm + $GA_3$ 150ppm, ($T_7$) $_{S3G1}$ = 30 x 25cm + $GA_3$ 50ppm, ($T_8$) $S_3G_2$ = 30 x 25cm + $GA_3$ 100ppm and ($T_9$) $S_3G_3$ = 30 x 25cm + $GA_3$ 150ppm etc. Vase solution of GA3 acid (150ppm) was used to study the vase life of gladiolus spikes. The gladiolus cultivars was planted on October 2016and harvested on 10th March and 30th March indicated that.The Influence of $GA_3$ 150ppm found significant role on sprouting (viz. day to 1st sprouting) vegetative characters (plant height, number of leaves per plant) Flowering attributes viz. days to initiation of 1st flower stick, number of days taken for initiation of first florets, length of spike, number of spikes, number of florets, vase life of gladiolus.The treatments 150ppm $GA_3$ was found significantly superior over the treatments in respects to sprouting percent, height of plant, number of leaves per plant, days to opening of 1st florets, length of spike, number of spike per plant and vase life of spikes. But $GA_3$ 150ppm was found significantly in increase the gladiolus spike.The spacing (30 x 25cm) showed significance in all the positives characters of sprouting percentage of growth and flowering. The reduce sprouting percent, days to opening of 1st florets, increasing plant height, number of leaves, length of spike, number of spike per plant, number of florets and vase life of spikes.Among the $GA_3$ 150ppm was found significantly superior over other combination with most of the sprouting, vegetative and floral characters. On the basis of result summarized above the following specific conclusions are being warranted

It may be concluded that foliar feeding of $GA_3$ @ 150ppm caused beneficial effect on height of the plant, number of leaves per plant and days to 1st opening of florets, number of florets per spike, length of spike and vase life of spike.

**Keywords**

Gladiolus *(Gladiolus grandifloras L.)*, Gibberellic acid, flowering and quality

## Introduction

Gladiolus is a popular flowering plant grown all over the world, from South Africa to West Asia. The name gladiolus was derived from the Latin word gladioli, because of its sword-like leaves. It is popularly known as sword lily. It was introduced for the cultivation at the end of the 16th century (Parthasarathy and Nagaraju, 1999).The modern hybrids is botanically known as *Gladiolus grandifloras* belonging to family

Iridaceae.In the international cut-flower trade gladiolus occupies fourth place. It is mainly cultivated for cut-flowers because of its elegant appearance and prolonged vase life. As a cut flower, it has great potentialities for the export to European countries during the winter months to even the valuable foreign exchange. Therefore, growing gladiolus on scientific footing is of immense needs for getting the quality blooms with exportable standards. Gladiolus spikes are most popular in flower arrangements and for preparing attractive bouquets (Mishra *et al.,* 2006). The magnificent above inflorescence with various colours have made it attractive for use in herbaceous borders, beddings, rockeries, pots and for cut flower. Due to its immense potential as ornamental crop and utter dearth of plant material of such elite species for commercial cultivation, need was felt to recuperate our production technologies for better qualitative as well as quantitative traits. An exogenous application of gibberellins has brought major advances in field of agriculture. Among exogenous gibberellins, $GA_3$ has been commonly used to manipulate vegetative growth, flowering and quality aspects in flowering crops.Apart from ornamental value, gladiolus have extensively utilized in medicines for headache, lumbago, diarrhea. Rheumatism and allied pains. Flower and corm of some gladiolus are used as food in many countries (Khan, 2006). The flowers of different Gladiolus sp. are used as uncooked salad by nipping of their anthers. There are many factors which can affect plant growth and economic cultivation of gladiolus such as variety, size of corms and cormel, depth of planting, application of fertilizers etc. The number of florets per spike, longest spike and rachis length, flower quality, corm and cormel production etc.

Proper plant spacing is also necessary for higher yield of spikes, corms and cormels. The spacing depends on the purpose for which the crop is grown. For commercial cultivation, high-density planting is recommended. The corm number, corm weight and cormel production per corm decreased in closer spacing's. However, even the closest spacing produced corms of top grade (Arora, 1987). Flower quality (Length of cut flower, length of spike and number of florets) was poor in higher density plots (Huh rut *et al.,* 1996).The commercial production is still at the initial stage due to lack of information regarding its cultivation technology, different factors such as size of corm and cormel, planting time and depth management, use of chemicals like $GA_3$ etc., which influence the production and quality of gladiolus flower as well as its corm and cormels. Bulbous crops are greatly influences by the corms size. Corm is the food-storing underground stem and propagation material of gladiolus. The size of corm highly influences the vegetative growth, development and ultimately the spikes, flowers and corms production (Bose *et al.,* 2003).Normal plant growth and development are regulated by naturally produced chemically or phytohormones. Their role can often be substituted by application of synthetics growth regulating chemicals. These are becoming extremely important and valuable in the commercial control of crop's growth and flower production (Jinesh *et al.,* 2011). The potential use of growth regulators in flowers production has created considerable scientific interest the recent years. Many studies have indicated that the application of growth regulators can affect the growth and development of gladiolus (Chopde *et al.,* 2011).

## Materials And Methods

The materials used and methods employed during the tenure of investigation on the entitled "To assess the effect of $GA_3$ on

growth, flowering and quality ofgladiolus*(Gladiolus grandifloras L.*)"are as fallows.Planting material The experiment was carried out on gladiolus variety, "Snow Princess." Healthy and uniform size and corms were selected as a planting material.

**Preparation of growth regulators solution:**

ppm = mg/liters of water
1g/1000ml = 1000ppm

Preparation of growth regulator solution for 50ppm, take 1 liters distilled water and addition of 5mg GA3, this solution is prepared 50ppm solution of GA3 same as 100ppm and 150ppm solution was prepared. The chemicals used as growth regulators in the experiment are Gibberellic acid. Fresh stock solution of known concentration was prepared to carry out experiment. The chemicals were first dissolved in a minimum volume of alcohol and then mixed with distilled water to make a stock solution. The solution of required concentrations were then prepared from the stock solution by dilution.

**Concentration of Gibberellic acid**

$G_1$ = Gibberellic acid 1st Dose = $GA_3$ 50ppm
$G_2$ = Gibberellic acid 2nd Dose = $GA_3$ 100ppm
$G_3$ =Gibberellic acid 3rd Dose = $GA_3$ 150ppm

**Observations**

Five representative plants in each plot were selected randomly and tagged for observations. The observations with respect to growth, flowering and corm production in gladiolus are as follows:

**Corms characters**

**Sprouting percent**

The number of days taken for 7 corms to sprout in each treatment and each replication were taken as days to 50% sprouting.

**Growth parameters**

**Height of plant (cm) at 30 and 60 DAP**

The height of plant was recorded from ground level to the apex of the top most florets in the 5 tagged plants of each treatments and recorded in cm at 30 and 60 DAP.

**Number of leaves per plant at 30, 60 DAP**

Number of functional leaves i.e. fully developed and green leaves were counted from each tagged plants at 30 and 60 DAP.

**Quality characters**

**Days to opening of 1st florets (Days)**

The number of days required for the initiation of first flower stick under each treatment was recorded.

**Number of spike per plant**

The number of days taken for the initiation of florets from the stick under each treatment was recorded.

**Number of florets per spike**

The number of first florets spikewas counted on the days when last floret was fully opening in each treatment.

**Length of spike (cm)**

Spike length was recorded by measuring the distance between first leaf and last floret of the spike at the time of last floret opening.

## Yield and Yield attributes

### Vase life of spike

Spikes were kept in a bottle or flask filled with 150ppm GA3 at room temperature. The vase life of spikes were recorded on maximum values of the days.

## Results And Disccussion

In this chapter result embodies an elaborate account of various studies made during the period of investigation on the experimental crops of gladiolus, Cultivar"Snow Princess" (*Gladiolus grandifloras* L.). The analysis of variance (ANOVA) have been appended at the end of this thesis, after the bibliography and referred at appropriate places in the text.

### Sprouting percent

Data collected on account of percentage of sprouting of gladiolus as affected by different doses of Gibberellic acid, have been portrayed in table No. 01.Critical analysis of data mentioned in above table obviously marked out that sprouting percent in gladiolus was significantly affected by the use of Gibberellic acid and Maximum sprouting percent i.e. 13.06 was obtained when used @ 100ppm.

### Plant height (cm)

Data assembled towards plant height of gladiolus as affected by different doses of Gibberellic acid have been portrayed in table No.02.An examination of data mentioned in above table clearly indicated that plant height in gladiolus was significantly affected by the use of Gibberellic acid and Maximum plant height i.e. 63.88cm and 75.34cm was recorded at 30 and 60 DAP by the use of 150ppm Gibberellic acid.

### Number of leaves per plant

Data regarding number of leaves per plant of gladiolus as affected by different doses of Gibberellic acid have been tabulated in table No.03**.** A glance at the data presented in above table registered the number of leaves in gladiolus and significantly affected by the use of Gibberellic acid. Maximum number of leaves i.e. 5.15 and 7.35 per/plant were recorded at 30 and 60 DAP respectively by use of 150ppm Gibberellic acid.

### Days to opening of 1st florets (Days)

Data accumulated in connection with days to first flowering in gladiolus have been tabulated in table No. 04.An observations on the data obviously indicated that days to opening of 1st florets in gladiolus were significantly affected by the use of Gibberellic acid higher doses of GA3 which is minimum days to opening of 1st florets i.e.- 64.46 (days) were recorded by the use of 150ppm Gibberellic acid.

### Number of spike per plant

Data collected on account of number of spike per plant of gladiolus as affected by different doses of gibberellic acid have been portrayed in table No. 05.It is observed from the data referred in above table indicated that received the application $GA_3$ @ 150ppm brought paramount improvement in number of spikes per plant and maximum spikes per plant (1.37) spikes/plant were found which was significantly superior over rest of the treatment. A higher number of spikes were noticed when higher doses of $GA_3$ were word.

**Table.1** Sprouting percent of gladiolus as influenced by different doses of Gibberellic acid,

| Treatments | Sprouting percent |
|---|---|
| **$GA_3$** | |
| $G_1$(50ppm) | 11.42 |
| $G_2$(100ppm) | 13.06 |
| $G_3$(150ppm) | 12.96 |
| **SEm±** | **0.45** |
| **CD (p=0.05)** | **1.36** |

**Table.**2 Plant height of gladiolus as influenced by different doses of Gibberellic acid**,**

| Treatments | Plant height (cm) | |
|---|---|---|
| | **30 DAS** | **60 DAS** |
| **$GA_3$** | | |
| $G_1$(50ppm) | 55.84 | 65.77 |
| $G_2$(100ppm) | 63.66 | 75.24 |
| $G_3$(150ppm) | 63.88 | 75.34 |
| **SEm±** | **2.27** | **2.64** |
| **CD (p=0.05)** | **6.82** | **7.93** |

**Table.3** Number of leaves of gladiolus as influenced by different doses of Gibberellic acid,

| Treatments | Number of leaves | |
|---|---|---|
| | **30 DAS** | **60 DAS** |
| **$GA_3$** | | |
| $G_1$(50ppm) | 4.30 | 6.14 |
| $G_2$(100ppm) | 4.98 | 7.13 |
| $G_3$(150ppm) | 5.15 | 7.35 |
| **SEm±** | **2.27** | **2.64** |
| **CD (p=0.05)** | **6.82** | **7.93** |

**Table .4** Days to opening of first flowering of gladiolus as influenced by different doses of Gibberellic acid,

| Treatments | Days of first flowering |
|---|---|
| **$GA_3$** | |
| $G_1$ (50ppm) | 77.03 |
| $G_2$ (100ppm) | 74.82 |
| $G_3$ (150ppm) | 64.46 |
| **SEm±** | **2.12** |
| **CD (p=0.05)** | **6.37** |

**Table.5** Number of spike of gladiolus as influenced by different doses of Gibberellic acid**,**

| Treatments | Number of Spike per Plant |
|---|---|
| **$GA_3$** | |
| $G_1$(50ppm) | 1.17 |
| $G_2$(100ppm) | 1.35 |
| $G_3$(150ppm) | 1.37 |
| **SEm±** | **0.04** |
| **CD (p=0.05)** | **0.12** |

**Table.6** Number of florets per spike of gladiolus as influenced by different doses of Gibberellic acid,

| Treatments | Number of florets per spike |
|---|---|
| **$GA_3$** | |
| $G_1$(50ppm) | 18.27 |
| $G_2$(100ppm) | 21.12 |
| $G_3$(150ppm) | 21.48 |
| **SEm±** | **0.67** |
| **CD (p=0.05)** | **2.00** |

**Table.7** Spike length of gladiolus as influenced by different doses of Gibberellic acid.

| Treatments | Spike length |
|---|---|
| **$GA_3$** | |
| $G_1$(50ppm) | 88.13 |
| $G_2$(100ppm) | 101.61 |
| $G_3$(150ppm) | 102.28 |
| **SEm±** | **3.06** |
| **CD (p=0.05)** | **9.19** |

**Table.8** Vase life of gladiolus as influenced by different doses Of Gibberellic acid,

| Treatments | Vase life |
|---|---|
| **$GA_3$** | |
| $G_1$(50ppm) | 15.12 |
| $G_2$(100ppm) | 17.43 |
| $G_3$(150ppm) | 17.46 |
| **SEm±** | **0.52** |
| **CD (p=0.05)** | **1.57** |

## Number of florets per spike

Data accumulated in connection with number of florets per spike in gladiolus have been tabulated in table No.06.An examination of data mentioned in above table obviously indicated that number of florets per spikes in gladiolus was significantly affected by the use of Gibberellic acid and maximum number of florets per spikes i.e. 21.48 florets/spikes were recorded by the use of 150ppm Gibberellic acid.

## Length of spike (cm)

Data regarding length of gladiolus as affected by different doses of gibberellic acid have been tabulated in table No.07. An observation on the data obviously indicated that length of spikes in gladiolus was significantly affected by the use of gibberellic acid and higher doses of $GA_3$ which is maximum length of spikes i.e.-102.28cm was recorded by the use of 150ppm gibberellic acid.

## Vase life of spike

Data collected on account of vase life of gladiolus as increased by different doses of gibberellic acid have been portrayed in table No. 08.It is observed from the data referred in above table indicated that received the

application of $GA_3$ @ 150ppm brought paramount improvement in vase life of spikes and maximum vase life of spikes per plant 17.46 were found which was significantly superior over rest of the treatment. A maximum vase life of spikes was noticed when higher doses of $GA_3$ were word.

Evaluation of different biological parameters of gladiolus cultivators was made during Rabi season of 2015-2016 with the object to see the most suitable, high quality and best cultivar for cultivation in Satna region of M.P. Study of various parameters is essential for such evaluation. Among them the most important ones are number of days taken for emergence of spike, number of days to opening of first florets, length of spike, number of spike per plant and vase life of the spike. In addition to these various other factors like sprouting percentage, height of plant, number of leaves per plant, length of spike, number of spikes per plant, number of florets per spike, days to opening of first florets and vase life ofspike also considered as these are the parameters which ultimately decide the yield and quality of flower spikes. A cultivar possessing the desirable characters as mentioned above would be considered good cultivars even through it lacks one or more other characters. The merits and demerit of one cultivars are dis-abuse based on the different parameter studied.The cultivars have shown highly significant different with respect to sprouting percentage at different growth stage of plant. The Cultivars highest sprouting percentage was recorded i.e. 13.06 (30 Days), and found to highest sprouting percentage i.e. 11.42 at 60 DAP on GA3 under these stages. Hona and Goo (1991) under Korean conditions found that sprouting was earlier in the corms of cultivar“Snow princess” produced in Korean then in imported corms, days to sprouting and sprouting percent vary with corm shape. This trend may be attributed to varietal growth characters; it may differ in particulars variety according to temperature and season.

Other growth parameters viz. number of leaves per plant, and Length of spikes, showed highly significant differences, among the cultivars as for as number of leaves per plant was concerned this cultivars was maximum number of leaves noticed i.e. (5.15 & 7.35 (30 and 60 days) on GA3 @ 150ppm.

This trend may be attributes to the varietal growth of characters are almost different. The parameters of further responsible for best quality and yield of gladiolus cut-flower.

More number of leaves per plant resulted in increased height of plant, spike length and more number of florets per spike. The cultivars maximum plant height was recorded i.e. (63.88 & 75.34 at 30 and 60 days) respectively.

Plant height is vary important, it decide the spike length. When plant height become more the spike and florets also become longer which are important characters of gladiolus. Induction of flowering plays important role with respect to cut flower production in gladiolus. The cultivars has maximum number of days to opening of 1$^{st}$ florets was recorded i.e. (64.46 days) on GA3 @ 150ppm and wider spacing was recorded i.e. 81.89 (cm).

The cultivars had shown highly significant differences for the time taken for full emergence of spikes. Cultivar was the earliest (21.48 days) to come for full emergence of spike followed by (18.27) was the latest one as compared to the cultivars on an average they have taken 60 days. Hong

and God (1989) under vindhya region conditions and found that spikes emerged sooner and flowering was earlier in corms of gladiolus produced in maximum that the improved corms.

This variation may be attributes to the different temperatures and seasonal conditions prevailing at different places in the particular area cultivars have maintained the difference, noticed in the number of days taken for full emergence of spikes with other characters as first florets to bloom.

The results indicated that there is a particulars time period for each cultivars for flowering. Cultivars had shown highly significant a difference with respect to number of days to opening of first florets was recorded i.e. 64.46 days.

Cultivars "Snow Princess" was earliest (64.64 day) to blooms the first florets, followed by largest was the later (77.03 days)one.

The cultivars under study had shown highly significant differences with respect to spike length. The range for length of spike was obtained i.e. 88.13 to 102.28. respectively.

The minimum length of spike was observed i.e. 88.13 (cm) on GA3 @150ppm. It is a desirable character for cut flower because large spike and will last longer in vase life.

High significantly differences also existed with respect to the production of number of corms per plant was noticed i.e. 1.74 on GA3 @ 150ppm. Similar results were reported by gladiolus. Leena *et al.,* (1993).

## Reference

Arora, J. S. and Khanna, K. 1987. Spacing effects on flowers and corm production of gladiolus cv. Sylvia. *Indian J. Hort.*, 44 (1-2); 96-99.

Bose, T. K., Yadaw, L. P., Pal, Pal Das, p. and Parthasarathy, V.A. 2003. Gladiolus Commercial Flowers, 2nd Rev. ed. Nayaprokash, *Calcutta, India*.*Pp*. 1-112.

Chopde, Neha, Gonge and Nagrep.k. 2011. Effect of growth regulators on growth and flowering of gladiolus. *TheAsian Journal of Horticulture*vol.6 (2): 398:401.

Huh rut, Kungyang, Cho, Haeryong bang, Changseak, Song, Jeongseak, Goo, Daehal Kim Youngjimkim, Byeanghyeon, 1996. Effect of reflective film mulching and planting density on flowering and corm production of Gladiolus grandifloras.*RDA J. Agril. Sci. Hort.*, 38 (2): 503-507.

Hona and Goo, 1991. Studied on the cultivation of gladiolus (Gladiolus gandavensis) for cut flowers, *Research reports of the ruraldevelopment admistration horticulture,* 33(3):119-24.

Hong, Y. P., H. D. and Han, I. S. 1989. Studies on corm formation in Gladiolus grandifloras.Res. Rep. Rural Dev. Admin., Korea. 32:54-58

Jinesh, P.M., Patel, H. C., and Saiyad, M. Y. 2011.Effect of plant growth regulators on growth and yield of gladiolus cv. American-Beauty. *J. Agric. Sci.*, *7*(1):141-143.

Khan, F. N. 2006.Effect of some Auxins on growth of Damask Rose Cuttings in Different growing media.*Journal of Agriculture and Social Sciences*, 2(1): 13-16.

Leena, R., Rajeevan, P. K. and Valsalakumari P. K. 1993.Effect of their application of growth regulators on the growth, flowering and corm yield of gladiolus cv. Friendship.*South*

*Indian Hort.*, 10 (6): 329-335.

Mishra, A.K., Himanshu and Singh, A.K. 2006. Effect of corm size and spacing on growth, flowering and corm production of gladiolus in *sodic condition*: 119.

Parthasarathy, V. A. and Nagaraju, V. 1999.Gladiolus. (In: Floriculture and Landscaping. (Eds.) Bose, T. K., R. G. Maiti, R.S. Shua and P. Das.NayaProkash). *Pp.* 467-486.