Int.J.Curr.Microbiol.App.Sci (2019) *8*(6): 1739-1750

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 06 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.806.208

Effect of GA_3 on Reproductive Growth and Cormel Production of Gladiolus

N. Parween, S. Mishra, A. Adil*, A. Pal and K.K. Jha

Department of Horticulture, Faculty of Agriculture, Birsa Agricultural University, Kanke, Ranchi, India

**Corresponding author*

Keywords

Cormel, Gladiolus, Gibbrellic Acid, Reproductive traits

Article Info

Accepted:
15 May 2019
Available Online:
10 June 2019

A B S T R A C T

Gladiolus (family Iridaceae) is one of the most important bulbous flower crops due to its long attractive spike with variety of colours, prolonged vase life and its ability to withstand long distance transportation. Four different varieties of Gladiolus (V1-American Beauty, V2-Pacifica, and V3- Summer Pearl and V4-Single Jester) with uniform size of corms were taken for assessing the effect of four concentrations of GA_3 (25, 50, 75 and 100 ppm) on cormel production. The experiment was conducted in Factorial Randomized Block Design. Un-treated control was also maintained. The observations were recorded on various vegetative growths, cormel production and floral attributes. Spikes were harvested when basal florets showed colour. In this investigation GA_3 100 ppm was found most effective for enhancing reproductive growth Number of florets per spike (16.10) time taken for Colour breaking (89.53 days) were observed at 50 ppm. Maximum floret size (13.16cm) and earlier 50% flowering (84.81days) were recorded at 25 ppm GA_3. Treatment with GA_3 showed delayed 50% heading in (101.66 days) at 100 ppm. The results revealed that var. Summer Pearl recorded earlier colour break (89.53 days), earlier 50% flowering (84.80 days) and maximum cormel production (16.43) maximum number of florets per spike (16.10) and maximum florets size (13.16 cm) were exhibited by var. American Beauty.

Introduction

Floriculture has now emerged as an important venture in the world. It is available in a variety of colours and inflorescence having attractive florets. Gladiolus is an important bulbous flower grown throughout the world. It has originated in tropical and southern Africa. It belongs to family Iridaceae and is extensively grown for cut flower production apart from being used in herbaceous border, bedding, and pot culture. Commercial cultivation of gladiolus has gained popularity due to its high export potential and prevalence of congenial growing condition in various parts of the country. Now a day in India cultivation of gladiolus is the focus of large floriculture industries because of its popularity as cut flower and long keeping quality. In India, West Bengal, Maharashtra, U.P., Himachal Pradesh, Haryana and Andhra Pradesh are the major gladiolus growing states. It has added advantage that flower stalk can be packed in bulb stage, when the

lower florets just show their colours. Therefore, its cultivation as a cut flower can be taken up in far off areas provided they are well connected with big cities. Moreover during winter the climate in the Indian plain is ideal for cultivation of gladiolus thus providing a comparative for export to European countries where sub-zero temperature and snow cover during winter is a limitation for successful cultivation of gladiolus. Jharkhand with its diverse agro-climatic conditions have great potentialities of flower cultivation which will help the small and marginal farmers generating remunerative self-employment and also for earning foreign exchange through export floricultural produce.

Growth regulators have been found to influence the growth and flowering of gladiolus.GA3 has many regulatory effects on plant development. It stimulates synthesis of hydrolytic enzymes for digestion of endosperms reserves. GA_3 stimulate both cell division as well as cell enlargement. It can move freely along the stem in either acropetal or basipetal direction. The role of gibberellins is complicated both biologically, biochemically and even today is not fully understood (Arora *et al.,* 1992). Singh *et al.,* (2008) reported that gibberellic acid treatment cause to increase in longevity of gladiolus cut flowers; Mutuee *et al.,* (2001) concluded that gibberellins increase fresh weight of cut flowers; Weiss in 2000 reported that gibberellic acid could be a promoter for starting extension, coloration of flower and some genes of essential enzymes in anthocyanin pathway such as chalkon synthetase, chalkon isomerase, dihydroflavinol reductase. This plant growth regulator is produced in anthers, which are in developmental stage and then it is transferred into corolla where it enhances physiological and biological processes such as petal growth and pigment production.

The plateau region of Jharkhand offers an excellent climatic condition for cultivation of gladiolus, but little work has been conducted on the standardization of technology for gladiolus growing in this region. For successful production of any bulbous crop, growth regulators play an important role. Hence, considering the above points an experiment entitled "Effect of GA3 on reproductive growth and cormel production of gladiolus" was undertaken.

Materials and Methods

Experimental site

The site is located in the experimental area of the department of horticulture, under the faculty of Agriculture, Birsa Agricultural University, Kanke, Ranchi, Jharkhand during Kharif season of 2010.

Meteorological condition

The climate of Ranchi is sub humid tropical. The geographical situation of the place is between 23.17^0 latitude and 85^o19 E longitude and at an altitude of 625m above the mean sea level. The average annual rainfall is 1300-1400 mm and most of which is received between months of June to August. The climate is sub divided into distinct season i.e. summer, rainy and winter. Data on weather conditions were collected from meteorological observatory of the university throughout the experimental period.

The distribution and occurrence of the different aspect of have been illustrated in Figure 1. The mean daily temperature of the area is about 19.50^o C, the region is characterized by moderate summer and cold winter with lowest January temperature (coldest month) dropping down to 3.5^0 C and highest May temperature (hottest month) rising upto 39.2^0 c. The mean humidity is about 64 percent in the area.

Experimental detail

Treatments and varieties

The present investigation was carried out with four different levels of gibberellic acid (GA_3) applied on the corms of four different varieties of Gladiolus (V1-American Beauty, V2-Pacifica, and V3- Summer Pearl and V4-Single Jester). Varieties of gladiolus were procured from department of horticulture, B.A.U., Kanke, Ranchi. The treatment combinations used in this experiment have been given in Table 1.

Layout, plan and experimental design

The field experiment was laid out in Factorial Randomized Block Design (FRBD) with 20 treatments and three replications. There were three sub-plots, each having a size of 5mx 5m. All the treatments were accommodated in sub- plot randomly and each sub-plot consisted of 200 plants at a distance of 50cm x 20cm. A space of 50 cm was left between two sub plots.

Fertilizers

NPK was applied in two split doses, as basal application doses @ 10:20:20g/ Sqm and @5:10:10/5g/Sqm in top dressing.

FYM applied as soil application @Uniform dose of 5 Kg/sqm.

Preparation of experimental plot

The plot was cleaned by removing weeds, stubble and was thoroughly ploughed till the soil was brought to fine tilth. The plot was leveled and laid out according to plan. The well decomposed farm yard manure at the rate of 5kg/sqm was added to each plot and was incorporated in soil. Soil sampling was done randomly from different plots as per the soil sampling techniques. The composite soil sample was prepared by mixing these samples and the composite soil sample was subjected to analysis. NPK were applied inform of urea, SSP and MOP respectively @ dose 10:20:20g/sqm. FYM was applied at the rate 5kg/sqm. For this 125 kg was applied in each plot. The corms of uniform size from all varieties were selected; covering was removed gently without damaging the corms. The corms were soaked in GA3 for at least 24 hrs and dried properly under the shade and were sown in each plot according to layout and plan. Plants were irrigated as needed or whenever necessary throughout the cropping season by flooding method. Weeding and hoeing was done regularly starting from 15 days onwards after corms planting and whenever necessary throughout growing period. Regular Spraying of the plants with 0.2 percent Bavistin at an interval of 15-20 days was done to avoid the incidence of diseases. Spikes were harvested when the basal bud was just showing color. Spikes were cut just about where the stalk emerged from the sheathing leaf cluster. Corms were dug out after 45 days from flowering when the leaves started yellowing. They were dug out carefully so that no corms and cormels were lost in the process. The aerial parts, corms and cormels were separated and counted. The corms were dipped in 0.2 percent Bavistin solution for half an hr. and then air dried in shade and kept in Kraft paper bags in open crates for storage.

Recording of observation

Following observation on growth, yield and quality of flower, corms and cormels were recorded at proper time during experimentation.

Number of florets per spike
Floret size (cm)
Colour break of first florets (days)

Days to 50% flowering
Cormel production
Vase life

Statistical analysis

Date obtained from several attributes was analyzed statistically by the procedure described by Gomez and Gomez, 1984.

Results and Discussion

The result with logical interpretation as influenced by different treatment has been presented in chapter with the help of appropriate table.

Number of florets per spike

Regarding number of florets per spike has been presented in Table 2. From the perusal of data, it was observed that different levels of GA_3 had significantly affected the number of florets per spike and it was found that T4 level produced the maximum number of florets (14.55), followed by T2 (11.85) and T3 (11.54). The different varieties also showed significant influence on number of florets. V1 produced maximum number of florets per spike (12.62), followed by V4 (12.02). The interaction of VXT also had significant influence on number of florets per spike. The treatment combination V1T2 (16.10) recorded maximum number of florets per spike (16.10), followed by V3T4 (15.36) and V4T4 (15.00) was least number of floret per spike was recorded in V2T1 (8.97)

Florets size (cm)

The diameter of floret (cm) was recorded and presented in Table 3. Floret size of 12.53 cm was measured in T4 which was significantly maximum as compared to different levels of GA3 in various treatments. However, different varieties had no significant influence on floret size. Though maximum floret size of 9.63 cm was recorded in V2 followed by V4 (9.52cm), As evident from the data, the interaction of VXT was found effect the floret size significantly. Maximum floret size of 13.16 cm was recorded under treatment combination V1T1 followed by V4T4 (12.53). The treatment combination V1T0 recorded the least floret size (6.66cm).

Days taken to colour break of basal florets

The observations on number of days taken for colour break of basal florets have been presented in Table 4. From the perusal of data it was revealed that different levels of GA3 affected the character significantly in comparison to control (T0) where GA3 was not used Earliest colour break was recorded with T3 (93.88 days), followed by T1 and T2 (98.80 days). The higher doses of GA3 took lesser number of days for colour break of basal floret as compared T0 in (130.12 days). Similarly, different varieties were found to have non-significant effect on days taken to colour break of basal florets. However, earliest colour break was recorded in V1 (103.04 days) followed by V3 (103.57 days).The interaction of VXT significantly influenced on days taken for colour break of basal floret. Earliest colour break was recorded with treatment combination V3T2 (89.53 days) followed by V2T3 (89.92 days), the maximum number of days was recorded under treatment combination V3T0 (132.80days)

Days to 50% flowering

The data pertaining to days to 50% flowering have been presented in Table 5. From the perusal of data it was evident that minimum number of days to 50% flowering was recorded with T4 (95.73 days) which was significantly superior to all the levels of GA3 except T3 (97.55 days) and T2 (104.39 days)

which were at par with T4 (95.73 days). The varieties failed to produce any significant influence on days to 50% flowering. However, shortest duration was recorded with V3 (101.63 days) followed by V2 (103.40). As evident from data, the interaction of VXT was found to have non-significant influence on days to 50% flowering. However least number of days for 50% flowering was recorded by treatment combination V3T1 (84.81days), while maximum numbers of days were recorded in V4T0 (122.61 days)

Cormel production

The numbers of cormels were recorded at harvest and have been presented in Table 6. The data revealed that number of cormels were significantly maximum in T4 (13.57) followed by T3 (9.54). Although, the effect of varieties on cormel production, was found to be non-significant. However maximum cormel production was recorded in V3 (9.52). The result revealed that interaction VXT significantly increased production V3T4 recorded significantly maximum number of cormels (16.43), followed by V4T4 (13.13) in comparison to all other treatment combinations.

Vase Life

The data pertaining to vase life of cut flowers have been presented in 7. Perusal of data revealed that vase life of cut flowers was significantly influenced by GA_3. With application of higher concentration of GA3 that is (100 ppm) cut flowers survived maximum number of days in the vase (11.68days). The varieties did not influence the vase-life significantly, however maximum vase-life was observed with the V3 (10.76days). The interaction VXT showed that GA3 in combination with different varieties significantly enhanced the vase-life. The treatment combination V4T4 recorded the maximum vase-life of 14.6 days as compared to only 7.76 days in controls.

Numbers of florets per spike recorded at final stage revealed that this character was maximum at higher doses of GA_3. Nilimesh and Ray Choudhary (1988) observed that number of florets per spike increased significantly with the use of GA_3. Bose *et al.*, (1980) reported that in gladiolus, the number of florets was least affected by growth regulators. Dua *et al.*, (1984) reported increase in number of florets using higher concentrations of GA_3 as compared to lower concentrations of GA_3 on gladiolus. Ravidas *et al.*, (1992) observed greatest plant growth and higher number of florets per spike with GA_3 treatment (50-100ppm); Karaguzel (1999), observed increased flower number by soaking of corms at 100ppm GA_3 for one hour. It was found maximum (16.10) at 50 ppm GA_3. This phenomenon with respect to increase number of florets is in full agreement with Karaguzel (1999).

The data on days taken to colour break for basal floret showed significant effect (Table 4). Earlier colour break of basal floret (89.92 days) was observed in the Variety Pacifica treated with 75ppm GA_3. It may be due to higher anthocyanin pigment biosynthesis. Gibberellin increases the activity of anthocyanin gene transcription and aggregate pigment in corolla.

Berman and Rajni (2004) working with gladiolus cultivar American Beauty observed that GA_3 showed significant influence on growth and flowering (colour break of basal floret); Goren *et al.*, (1990), working with gladiolus reported that GA_3 significantly increased the floral traits (earlier colour break of basal floret); Ramachandrudu and Thangam (2007), reported that GA_3 (150 ppm and 100 ppm) advanced the flowering (days to spike emergence and flowering).

Table.1 Symbol of different treatments

Sl. No.	Symbol	Treatments (GA_3PPM)
1.	T0V1	Control
2.	T1V1	25 ppm
3.	T2V1	50 ppm
4.	T3V1	75 ppm
5.	T4V1	100 ppm
6.	T0V2	Control
7.	T1V2	25 ppm
8.	T2V2	50 ppm
9.	T3V2	75 ppm
10.	T4V2	100 ppm
11.	T0V3	Control
12.	T1V3	25 ppm
13.	T2V3	50 ppm
14.	T3V3	75 ppm
15.	T4V3	100 ppm
16.	T0V4	Control
17.	T1V4	25 ppm
18.	T2V4	50 ppm
19.	T3V4	75 ppm
20.	T4V4	100 ppm

Table.2 Number of florets per spike of gladiolus varieties as affected by levels of GA_3

	V1	V2	V3	V4	Mean
T0	10.13	10.90	11.50	11.40	10.98
T1	11.31	8.97	9.65	12.03	10.49
T2	16.10	12.73	9.08	9.50	11.85
T3	11.48	12.13	10.47	12.20	11.54
T4	14.10	13.76	15.36	15.00	14.55
Mean	12.62	11.70	11.20	12.02	
	VARIETIES	**TREATMENT**	**VxT**		
SEm	0.28	0.31	0.63		
CD5%	0.81	0.91	1.82		
CV5%	9.32				

WHERE, T0 = Control, T1 = 25ppm, T2 = 50 ppm, T3 = 75 ppm, T4 = 100ppm
V1 = American Beauty, V2 = Pacifica, V3 = Summer Pearl, V4 = Single Jester

Table.3 Floret size (cm) of gladiolus varieties as affected by levels of GA_3

	V1	V2	V3	V4	Mean
T0	6.66	8.40	8.70	9.60	8.36
T1	13.16	7.23	8.80	9.73	9.79
T2	9.53	12.50	6.90	8.60	9.38
T3	9.80	10.20	11.40	7.10	9.60
T4	8.16	9.83	10.07	12.53	12.53
Mean	9.46	9.63	9.18	9.52	
	varieties	**treatment**	**vxt**		
SEm	0.15	0.17	0.34		
CD 5%	N.S.	0.49	0.99		
CV 5%	6.38				

WHERE, T0 = Control, T1 = 25ppm, T2 = 50 ppm, T3 = 75 ppm, T4 = 100ppm
V1 = American Beauty, V2 = Pacifica, V3 = Summer Pearl, V4 = Single Jester

Table.4 Colour break (Days) of first basal floret of gladiolus varieties as affected by levels of GA_3

	V1	V2	V3	V4	Mean
T0	127.80	129.90	132.80	129.82	130.12
T1	95.93	95.36	99.66	124.18	98.81
T2	99.66	110.72	89.53	95.33	98.81
T3	95.19	89.92	97.65	92.75	93.88
T4	96.53	108.53	98.16	95.75	99.75
Mean	103.04	106.90	103.57	107.57	
	varieties	**treatment**	**vxt**		
SEm	2.24	2.50	5.07		
CD5%	N.S.	7.18	14.36		
CV5%	8.20				

WHERE, T0 = Control, T1 = 25ppm, T2 = 50 ppm, T3 = 75 ppm, T4 = 100ppm
V1 = American Beauty, V2 = Pacifica, V3 = Summer Pearl, V4 = Single Jester

Table.5 Days to 50% flowering of gladiolus varieties as affected by GA_3

	V1	V2	V3	V4	Mean
T0	114.30	116.00	107.25	122.61	115.40
T1	119.36	113.29	84.81	115.43	108.21
T2	96.79	88.33	119.50	113.00	104.39
T3	98.66	100.73	96.96	93.83	97.55
T4	99.26	98.73	99.63	85.30	95.73
Mean	105.67	103.40	101.63	106.03	
	varieties	**treatment**	**vxt**		
SEm	3.72	4.16	8.33		
CD 5%	NS	11.93	NS		
CV 5%	13.80				

WHERE, T0 = Control, T1 = 25ppm, T2 = 50 ppm, T3 = 75 ppm, T4 = 100ppm
V1 = American Beauty, V2 = Pacifica, V3 = Summer Pearl, V4 = Single Jester

Table.6 Cormel production of gladiolus varieties as affected by GA_3

	V1	V2	V3	V4	Mean
T0	2.66	4.83	6.13	7.00	5.15
T1	7.40	4.73	8.13	11.60	7.96
T2	12.13	12.80	6.13	7.16	9.55
T3	8.80	8.46	10.80	8.12	9.04
T4	12.26	12.46	16.43	13.13	13.57
Mean	8.65	8.66	9.52	9.40	
	VARIETIES	**TREATMENT**	**VxT**		
SEm	0.43	0.48	0.97		
CD 5%	N.S	1.40	2.80		
CV 5%	18.60				

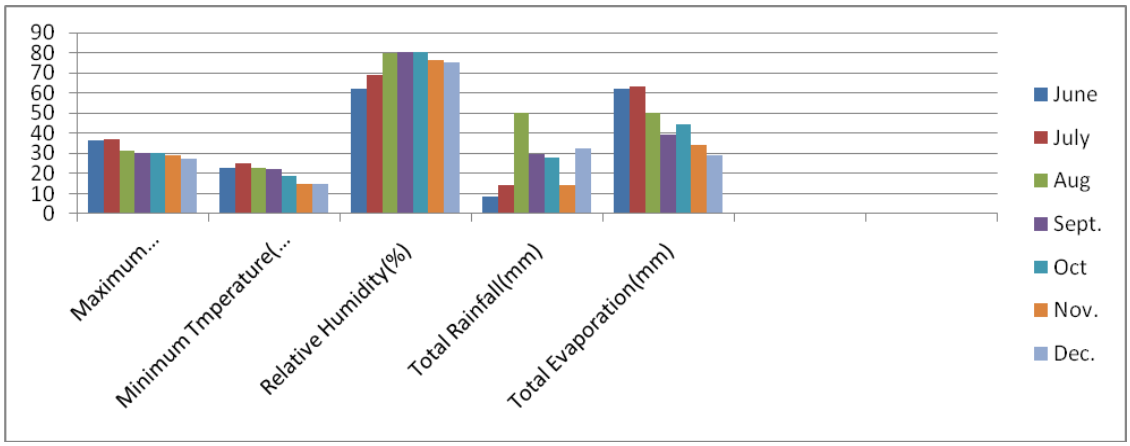
WHERE, T0 = Control, T1 = 25ppm, T2 = 50 ppm, T3 = 75 ppm, T4 = 100ppm
V1 = American Beauty, V2 = Pacifica, V3 = Summer Pearl, V4 = Single Jester

Table.7 Vase life (days) of gladiolus varieties as affected by levels of GA_3

	V1	V2	V3	V4	Mean
T0	7.76	8.20	10.96	12.13	9.76
T1	7.70	8.26	9.00	14.06	9.75
T2	9.60	9.03	7.93	15.03	10.40
T3	8.80	11.36	14.40	7.50	10.51
T4	8.70	12.26	11.16	14.60	11.68
Mean	9.78	10.69	10.76	10.45	
	VARIETIES	**TREATMENT**	**VxT**		
SEm	0.27	0.30	0.61		
CD 5%	NS	0.87	1.70		
CV 5%	14.70				

WHERE, T0 = Control, T1 = 25ppm, T2 = 50 ppm, T3 = 75 ppm, T4 = 100ppm
V1 = American Beauty, V2 = Pacifica, V3 = Summer Pearl, V4 = Single Jester

Fig.1 Meteorological condition during the period of experimentation



Characteristics of florets in terms of diameter (Table 3) were improved significantly due to different treatment combination. The increase in diameter of the florets represents expansion of the cell of florets. Yousuf *et al.,* (2006), observed that presoaking of gladioli corms for 24 hrs at different concentration (0-100ppm) in GA_3 increased flower diameter. Chattar *et al.,* (2006) conducted field trials with gladiolus cultivars, (Red Beauty, Jester, Summer Face) and four levels of GA_3 (0,100,200 and 300 ppm).They observed maximum floret size (13.01cm and 12.83cm); Umrao *et al.,* (2006) obtained significant increase in diameter of the florets by treatment with GA_3 at 100 ppm; Berman and Rajni (2004) working with gladiolus cultivar American Beauty observed that GA_3 (75p pm) significantly influenced on floral diameter of gladiolus. Our findings are in full agreement with Yousuf *et al.,* (2006).

Duration of 50% flowering as affected by different treatment combination was found to significant (Table 5). Earlier flowering was obtained in Summer Pearl at 50 ppm GA_3, It may be due to increased level of exogenous gibberellins activity in plants as gibberellins enhance cell elongation and cell enlargement. (Salisbury and Ross, 1986); Ravidas *et al.,* (1992) observed greatest plant growth and earliest flowering with GA_3 treatment (50-100ppm); Prakash and Jha (1998) observed that GA_3 treatment at 150ppm improved all the floral traits including earlier flowering; Nilimesh and Roy Choudhary (1988), observed the decrease in days to flowering with GA_3 treatment.

The effect of GA_3 on cormel production was found to be significant (Table 6). Large number of cormels was obtained in variety Summer Pearl at 100ppm GA_3 (16.43). It may be due to exogenous gibberellic acid, which promotes extensive growth of intact plant (Salisbury and Ross1989), and thus increase the number of cormels. The present finding are in close agreement with Bhattacharjee (1984), Singh *et al.,* (1996) who recorded increased number of cormels per plant at 75ppm GA_3. Berman and Rajni (2004) observed increase number of cormels per plant by Soaking of corms for 24 hrs; Yousuf *et al.,* (2006) also observed that presoaking of gladioli corms for 24 hrs at concentration (0-100ppm) in GA_3 increased number of cormels per plant; Dua *et al.,* (1984) found better corm multiplication when the plants were sprayed thrice with 100ppm GA_3; Kumar and Singh (2008) observed application of GA_3 (150 ppm) resulted in maximum yield of corms per hectare; Umrao *et al.,* (2006) obtained increase in number of cormels per plant by soaking of corms of cultivar Nova Lux in GA_3 (100 and 150 ppm. Ogale *et al.,* (2000), reported importance of GA_3 for vegetative growth and cormel production of gladiolus.

The influence of GA_3 on vase life was found to be significant (Table 7), longest vase life (14.60 days) was obtained in variety Single Jester at 100ppm GA_3 (14.60 days). It may be due to gibberellic acid, it increases conservation of carbohydrates in stem and petal tissue and improves cell membrane thus delaying membrane degradation in cell (Kwack *et al.,* 1997), Pal and Choudhary (1998) also reported maximum spike length at 20 ppm GA_3, while 40 ppm GA_3 produced spikes having longest life in the field. Chattar *et al.,* (2006) conducted field trials with gladiolus cultivars,(Red Beauty, Jester, Summer face.) with four different levels of GA_3 (0,100,200,and300 ppm).They observed maximum vase life (14.33 and 13.70) at 200 and 300 ppm GA_3. Umrao *et al.,* (2006) obtained maximum longevity and vase life at GA_3 100 and 150ppm. Emami *et al.,* (2011) observed maximum vase life at 75ppm GA_3; Singh *et al.,* (2008) observed that GA_3 treatment increased longevity of gladiolus cut flowers. Our findings are in full agreement

with Chattar *et al.,* (2006), who reported longest vase life in higher concentration of GA_3.

Summary and Conclusions are as follows:

Total number of florets per spike with maximum 14.55 at T4 (100ppm) and the variety V1 (12.62) was found best while the treatment combination V1T2 (16.10) recorded maximum number of florets.

The diameter of the floret was recorded maximum (12.53cm) with T4 level of GA_3. In case of varieties, maximum floret size (9.63cm) was recorded in V2.The interaction result V1T1 recorded maximum floret size of 13.16cm.

GA_3 levels T_3 (75ppm) recorded earliest colour break in 93.88 days. Minimum 103.04 days were taken for colour break of basal floret by V1. The interaction result V3T2 recorded 89.53 days for colour break

The duration of 50% flowering was observed with T4 (95.73days). By decreasing the levels of GA_3 50% flowering duration prolong to 104.39 days in T2. The variety V3 recorded 101.63 days for 50% flowering. Interaction of VXT i.e V3T1 recorded least number of days (84.81) for 50% flowering.

The number of cormels was recorded maximum with T4 (13.57). Maximum cormel production was recorded in V3 (9.52).

The treatment combination V3T4 recorded maximum number of cormels 16.43.

Vase life of cut flower was recorded maximum (11.68days) with application of T4 (100ppm GA_3). The maximum vase life 10.76 days was obtained by the variety V3. The treatment combination V4T4 recorded maximum vase life of 14.16 days

On the basis of above finding it can be safely inferred that GA_3 at all levels recorded better Reproductive growth, superior yield attributing features and floral traits as well as prolonged vase life and higher net returns in different cultivar of gladiolus. Though all the four varieties responded positively to GA_3 treatment at all levels but the variety American Beauty along with concentration treatment with 100 ppm GA_3 gave the best result i.e. floret size, and number of floret per spike and hence can be recommended for commercial cultivation.

References

Arora, J.S., Singh, K. and Grewal, N.S. (1992). Commercial flowers T.K. Bose, Gladiolus (30-31). *Ind. J. Plant Physiol.,* 35: 202-206.

Awad, A.R.E. and Hamied, A.A. (1985). Commercial flowers T.K. Bose, Gladiolus (30-31). *Acta Horticulture*, 167: 177-185.

Berman, D. and Rajni, K. (2004). Effect of chemical on dormancy breaking, growth, flowering and multiplication. *J. Orn. Hort.,* 7:1; ISSN 0972-0499.

Bhattacharjee, S. K. (1984). Effect of growth regulating chemical on gladiolus, *Gartenbauswissenschaft*, 49: 103-106.

Bose,T. K., Jana, B.K. and Mukhopadhyay, T.P. (1980) Effect of growth regulators on growth and flowering in *Hipperastrum Hybridum* Hort. Scintia Hort,12 (2) 195-200.

Castro, P. R.C., Minami, K., Gil, C.M. and Denetrio, C.G.B. (1979). *Anais da escola superior de Agricultura, Luiz de queiroz*, 36:153-171.

Chattar, D. P., Yamini, K. and Gupta, N. (2006). Effect of GA_3 on growth, flowering and corm yield in cv of gladiolus, *J. Orn. Hort.,* 9(2) ISSN 0972-0499.

Dua, I. S., Sehgel, O. P. and Chork, K. S.

(1984). Gibberellic acid induced earliness and increased production in gladiolus *Gartenbauwiss*, 49, 91-94

Dutta, M., Katwate, S.M., Patil, M.T., Nimbalkar, C.A. and Sanawan, P.C. (2001). Effect of GA_3 soaking on the germination of hybrid seed of gladiolus. *J. Maharashtrea Agril. Univ.,* 23(3) 313-314.

Emami, H., Saeidinia, A.H., Bakshi, D. and Ghorbani, E. (2011). Effect of GA_3 in growth and flowering of lily. *Adv. Env. Biol.*, 5(7); 1606-1611.

Emonger, V. and Tshwenyane, S.O. (2004). Effect of GA_3 on post-harvest vase life of yeaster lily, Agric. Sci. 170-174.

Gehen, G., Mustafa, Mona, F. A. A. (2011). Effect of GA_3 and IAA on improving growth and phytochemical combination in *Balanities aegyptica*. *Am. J. Plant Physiology*. Pp 1-7.

Gomez, K. A. and Gomez, A. A. (1984). Statistical Procedure for Agricultural Research, John Wiley and Sons, Singapor.

Growen, N.P. and Slangen, J. H. G. (1990). Nitrogen fertilizer recommendation for gladiolus based on nitrogen mineral soil analysis Act. *Hort. 5th Int. Symp.* on floer bulb Washington USA.

Haley, A.H. and Shillo, R. (1970). Promotion of growth and flowering plant treated with endogenons GA3 in gladiolus plants treated with growth retardant CCC. *Physiol Plant*, 23: 820-827.

Karaguzel, O., Alien, S., Doran, I. and Sogut, Z. (1999). Improved crop quality by nutrient management Kluwer Academic Publisher pp250-262.

Kumar, K., Suresh Shekhar, R., Chandra, Padma, M., Shankar, A., Siva (2009). Effect of PGR on dormancy, corm and cormel production in gladiolus, *J. Orna. Hort.* 12(3); 08972-0499

Kumar, P., Navin, Reddy, Y.N. and Chandrashekhar, R. (2008). Effect of growth regulators on flowering and corms production in gladiolus. *Ind. J. Hort. Sci.,* 65, Issue-1. ISSN 6972-8538.

Lepez Oliveras, A., Mlopez Perez, D. and Pages Pallares, M. (1984). Anales del institute. Nacinal de Invetigaciones Agrarias, *Agricola*, 27; 29-45.

Mahesh, K.S. and R.L., Mishra (1993). Effect of growth regulators in gladiolus. *J. Orn. Hort.*, 1(2); 12-15.

Mishra, R.L., Tripathi, D.K. and Chaturvedi, O.P.(1993), Implication of gibberellic acid spraying on the standing crop gladiolus var. Sylvia. *Prog.Hort*.25 (3/4)147.

Mutuee, T.M., V.E., Emongor and M.J., Hutchinson (2001). Effect of Accel on the vase life and post-harvest quality of (*Alestroemeria aurantiaca* L.) cut flowers. *Afric. J. Sci. Technology*, 2: 82-88.

Nilimesh, R. and N., Roy Choudhary (1988). Effect of plant spacing and growth regulators on growth and flowering of gladiolus grown under polythene tunnel *Acta. Hort. Int. Symp.* of protected cultivation of ornamental in mild winter climate.

Rajiv, K., Dubey, R.K., Mishra, R.L. (2002). Effect of GA_3 on growth, flowering and corm production in gladiolus. *Flor. R. Trend in Ind.*, 110-113.

Ramachandrudu, K., Thangam, M. (2007). Response of PGR, coconut water on vegetative growth, flowering and corm production in gladiolus, *J. Orn. Hort.*, 10; 1, 2007. ISSN 0972-0499.

Ravidas, L., Rajeevan, P.K., Valsalakumari, P.K. (1992). Effect of foliar application of growth regulators on growth, flowering and cormel yield of gladiolus cv. Freinship, *South. Ind. Hort.*, 40:329-335.

Ross, Z.J., J.B., Ried, P., Gaskin and J., Machillan (1989). Intermodal length in

pisum. Estmation of GA3 level in genotype Le, Le and led *Physiol. Plant*, 76; 173-176.

Salisbury, B.F., C.W. (1986). Ross, plant physiology Wordsworth publ. company S.A. pp 321.

Sharma, J.R., R.B., Gupta and R.D., Panwar (2004). Growth flowering and corm production of gladiolus cv. Friendship as influenced by foliar application of nutrient and growth regulators.

Singh, A., J., Kumarand and P., Kumar (2008). Effect of PGR and sucrose on post-harvest physiology, membrane stability and vase life of cut spike of gladiolus. *J. Plant. Gr. Regulator*, 51: 221-229.

Singh, A., Kumaran and Kumar, P. (2008). Effect of PGR on post-harvest physiology membrane stability and vase life of cut spike of gladiolus, *J. PGR*, 51; 221-229.

Singh, M. K., Parmar, A.S., Rathor, S. V. S. (2002). Edit. Misra R.L., Sanyat Misra corm production as affected by size of cormels and GA_3 application. *Floriculture Research Trend in India*, 246-248.

Singh, M. K., Parmar, A.S., Rathor, S.V.S. (2002). Corm production in gladilolus as effected by size of cormel and GA3 application. *Flor. R. Trend Ind.*, 246-248.

Sjekers, M. K., Nimith, Z.K., Kalman, J., Mathur and Kaus Chama *et al.*, (1990). Brassinosteroid rescue the deficiency of CYP 90 a cyto.

Sudhu, S.S. and Verma, T.S. (1998). Effect of different size of cormels and various treatments in gladiolus cv. White. *Oak, Recent Hort.*, 4: 69-70.

Umrao Vijay, K., Singh, R.P., Singh, A.R. (2007). Effect of GA3 and growing media on vegetative and floral attributes of gladiolus. *Ind. J. Hort.*, 64(1), ISSN 0972-8538.

Vijay, K., Singh, A.R. (2008). Effect of GA_3 and growing media on growth and flowering and corms production in gladiolus, *Prog. Agril.*, 8(2).

Weiss, D. (2000). Regulation of flower pigmentation and growth: multiple signaling pathway control anthocyanin synthesis in expanding petals. *Physiol. Plantrum*, 11(2): 152-157.

Yousuf, S. S. A. and Md. S., Alsafar (2006). Effect of GA_3 treatment and nitrogen on growth and development of gladiolus corms. *Pak. J. Bio. Sci.*, 9(13), 2516-2519.

How to cite this article:

Parween, N., S. Mishra, A. Adil, A. Pal and Jha, K.K. 2019. Effect of GA_3 on Reproductive Growth and Cormel Production of Gladiolus. *Int.J.Curr.Microbiol.App.Sci.* 8(06): 1739-1750. doi: https://doi.org/10.20546/ijcmas.2019.806.208