UNDER PEER REVIEW

Original Research Article

A COMPARATIVE STUDY ON GROWTH FLOWERING AND CORM PRODUCTION THROUGH BY GROWTH REGULATORS & CUT CORMS OF GLADIOLUS (*Gladiolus grandiflorus L.*)

ABSTRACT

The present investigation was carried out during cool season at Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of AgricultureTechnology and Science Prayagraj (U.P.), India. The experiment was laid out in randomized block design with three replications. Treatments consisted of Full corm, ½, ⅓ corms (cut corms) and growth regulators GA3 @150ppm (full corm), 200ppm (½ corm, 250ppm (⅓ corm), 300ppm (full corm), 350ppm (½, corm), 400ppm (⅓ corm). Among the different treatments, T3 (GA3@ 150ppm full corm) gave the best performance in terms of good growth, flowering and corm production which includes Plant Height, Number of leaves, Days to spike emergence, Days to opening of the first floret, First florets durability (days), Rachis length(cm), Number of florets/ spike, Number of spike/plant, Spike yield/ha, Number of cormlets/planted corm, Corm yield/ha,no.of corms/plant, Weight of Corms/plot.

Keywords; *Cut corms, GA_3,Gladiolus,*

1. INTRODUCTION

Gladiolus (Gladiolus spp.) is a significant bulbous crop that is a member of the South African-originating Iridaceae family. Due of its widespread cultivation among the bulbous ornamentals, it is known as the "Queen of Bulbous Ornaments." This blossom has an its beauty and elegance have both financial and aesthetic worth. Excellent are the protracted blossom spikes. when placed in vases as cut flowers for decoration.

Gladiolus is cultivated as a flower bed in gardens and used to create premium bouquets and floral arrangements for interior decorating *(*Lepcha *et al*. 2007*)*. On an area of 9.37 thousand acres, it is commercially grown in India's West Bengal, Himachal Pradesh, Sikkim, Karnataka, Uttar Pradesh, Tamil Nadu, Punjab, and Delhi, producing 707 million spikes per year. The crop is currently in high demand on both domestic and foreign markets. Any effort to promote cut flower production in the area not only helps consumers and florists obtain fresh and high-quality cut flowers on a regular basis, but it also aids the small and marginal farmers in the area in improving their financial standing *(*Naresh *et al.* 2015*)*.

Gladiolus corms are divided into many parts during propagation in order to increase plant material. One of the most cost-effective ways to boost the yield of corms and cormels in this case is to divide the corms. According to (Gromov 1972*)*, corm division is mostly determined by the cormlets size and the presence of buds on the corms. Depending on the amount of buds, medium corms are reportedly divided into two or three portions. Each division ought to have a blossom and some root growth. According to (Singh *et al. 2013)*, the use of various plant growth regulators stimulates early flowering and improves plant development in terms of plant height, flower quantity, and corm yield in gladiolus. In mature propagated plants, where GA3 concentrations are highest, dormancy in both buds and seeds scan be overcome. Gibberellic acid breaks dormancy, promotes growth, and postpones senescence. This study was taken to find out the suitable corm size (full and cut) and growth regulators on growth, flowering, spike and corm yield.

2. MATERIALS AND METHODS

The experiment was conducted at Experimental Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during 2021 during rabi season in India.

Some of selected large corms were cut in to sections according to treatment, retaining a bud with each sections, Bavistin was applied to whole corm to prevent fungus then the segments are treated with GA3 with respect to treatments. The experiment was laid out in randomized block design with three replications consisting of 9 treatments Corms were planted in November at a spacing of 30 cm x 30 cm and a depth of 5–6 cm. Statistical analysis of variance was performed on the data collected throughout the experiment. The observation were recorded for plant height, number of leaves, Days to spike emergence, Days to opening of first floret, Spike length, Rachis length, Number of florets/ spikes, Spike yield, Number of spikes/ha, cormlets yield, Weight of Corm/ plot (g). The significance of the treatments was determined using the 'F' test at a level of significance of 5%.

3. RESULTS AND DISCUSSION

Growth parameters

The data on growth parameters in different treatment combinations was recorded (Table 1). Plant height was increased significantly by plant growth regulator application compared to control in the analysis of data. The maximum plant height was recorded in T3 (fullcorm +GA3@150 ppm) (115.16) being significantly superior while minimum was in T8 (1/3 Corm + GA3 @ 400ppm) (91.2). Growth regulators significantly maximum number of leaves in GA3 @150ppm (6.53) was recorded in treatment T3(Full Corm+GA3 @ 150 ppm) which was statistically at par value. Whereas minimum Number of leaves (4.63) was recorded in treatment T8 (1/3 Corm + GA3 @ 400ppm). Maximum Spike emergence (78.46) was found to be in treatment T3 (Full Corm + GA3 @150 ppm) and T0 (Full corm) No chemical (77.96) which was statistically at par. Whereas minimum Spike emergence (61.63) was recorded in treatment T8 (1/3 Corm + GA3 @ 400 ppm). Minimum days to opening the first floret (76.03) was recorded in treatment T8 (1/3 Corm)+GA3 @ 400ppm). Whereas maximum days to opening of the first floret (93.89) was found to be in the treatment T3 with (Full corm+GA3 @150 ppm) which was statistically at par value.

Maximum first floret durability (4.00) was found to be in treatment T3(Full Corm+GA3 @ 150 ppm) which was statistically at par value. Whereas minimum first floret durability (3.00) was recorded in treatment T8 (1/3 Corm+GA3 @ 400ppm).

GA3 increased height of the plant over control which may be due to the growth promotion effect of GA3 in stimulating and accelerating cell division, increasing cell elongation and enlargement or both (Hartmann *et al*., 1990). Number of leaves is negatively correlated to peroxidase activity (Galston and Davies 1969) and probably due to these hormone treatments there is suppression of either peroxidase production or inactivation resulting in an increase in number of leaves. Also, GA3 induces active cell division in apical meristem and is also helpful in elongation of individual cells which results in improved vegetative growth. GA3 induces active cell division in apical meristem and is also helpful in elongation of individual cells which results in spike emergence. Similar results were also obtained by (Barman D *et al*., 2006). Floret durability were increases significantly by apply GA3 and this occurs because of GA3 encourage vegetative growth, enhances the photosynthetic and metabolic activities, causing taller plant that provide taller spike and rachis Bhande *et al;*(2015) gladiolus to which spike length and rachis length increased thereby allowing florets to grow larger Neha *et al*., (2015).

Flowering parameters

The data on flowering parameters in different treatment combinations was recorded (Table2). Rachis length was increased significantly by plant growth regulator application compared to control in the analysis of data Maximum rachis length (42.83 cm) was found to be in treatment T3 (GA3@ 150ppm+Full Corm) (42.3) which was statistically at par value. Whereas minimum rachis length (40.5) was recorded in treatment T8(1/3 Corm+GA3@ 400ppm). Maximum No. of florets per spike (14.43) was found to be in treatment T3(Full CormGA3+ @ 150 ppm) followed by T0(Fullcorm+No chemical) (13.8) which was statistically at par value. Whereas minimum No. of florets per spike (7.96) was recorded in treatment T8 (1/3 Corm+GA3@ 400ppm). Maximum Spike length (68.97cm) was found to be in treatment T3(Full Corm+GA3 @ 150 ppm) followed by T0(Fullcorm+ No chemical) (67.67) which was statistically at par value. Whereas minimum spike length (61.00) was recorded in treatment T8 (1/3 Corm+GA3 @ 400ppm). Maximum floret diameter (7.96 cm) was found to be in treatment T3 with (Full Corm+GA3 @ 150 ppm) followed by T0(Fullcorm+ No chemical) (7.93) which was statistically at par value. Whereas minimum floret diameter (7.3) was recorded in treatment T4 (1/3 Corm+GA3 @ 400ppm). Maximum floret length (11.9 cm) was found to be in treatment T3(Full Corm+GA3 @ 150 ppm) followed by T0(Full) No chemical (11.7) which was statistically at par value. Whereas minimum floret length (10.26) was recorded in treatment T8 (1/3 Corm+GA3 @ 400ppm).

Rachis length were increases significantly by apply GA3 and this occurs because of GA3 encourage vegetative growth, enhances the photosynthetic and metabolic activities, causing taller plant that provide taller spike and rachis Bhande *et al* (2015) gladiolus to which spike length and rachis length increased thereby allowing florets to grow larger Neha *et al.,* (2015) Gibberellic acid promotes the growth of auxiliary buds and their flowering increase in number of florets with the application of GA3 (Panwar *et al*; Asil *et al.,* 2011) .The increased spike length with GA3 might be due to rapid internodal elongation as a result of increased cell division and cell elongation in the intercalary meristem. Plant growth regulators such as GA3 promotes vegetative growth and increases the photosynthetic and metabolic activities resulting in more transport and utilization of photosynthetic products which might have resulted in increased spike length. Similar results were also reported by Kumar and Singh (2005). Increase in diameter due to low concentrations of GA3 application and decrease due to higher concentration as observed in the present study is in conformity with the findings of Bhattacharjee (1984) who observed that concentrations of GA3 as it increased from 10 to 1000 ppm decreased the flower diameter correspondingly. Increase in flower diameter by GA3 application was also reported by Prakash and Jha (1998).

Yield Parameters

The data on yield parameters in different treatment combinations was recorded (Table 2). No of spike/plant was increased significantly by plant growth regulator application compared to control in the analysis of data. Maximum No. of spike per plant (2.3) was found to be in treatment T3(Full Corm+GA3 @ 150 ppm) followed by T0 (Fullcorm+ No chemical) (2.03) which was statistically at par value. Whereas minimum No. of spike per plant (1.26) was recorded in treatment T8(1/3 Corm+GA3 @ 400ppm). Maximum spike yield (207000) was found to be in treatment T3 (Full Corm+GA3 @ 150 ppm). Whereas minimum spike yield (113400) was recorded in treatment T8 (1/3 Corm+GA3 @ 400ppm). Maximum No. of cormlets /planted corm (3.17) was found to be in treatment T3(Fullcorm+GA3@150 ppm) followed by T0(Fullcorm+No chemical) (3.06) which was statistically at par value. Whereas minimum No. of cormlets /planted corm. (1.16) was recorded in treatment T8(1/3 Corm+GA3 @ 400ppm). Maximum Corm yield/ha (1199.35) was found to be in treatment T3 (Full Corm+GA3 @ 150 ppm). Whereas minimum Corm yield/ha (450) was recorded in treatment T8 (1/3 Corm+GA3@ 400ppm). Maximum No. of Corms/plant (2.17) was found to be in treatment T_3 with (Full Corm) GA_3 @ 250 ppm. Whereas minimum No. of Corms/plant. (1.57) was recorded in treatment T_8 (1/3 Corm+ GA_3 @ 400ppm). Maximum Weight of Corm / plot (g) (36.00) was found to be in treatment T_3 with (Full Corm) GA_3 @ 250 ppm. Whereas minimum Weight of Corm/ plot (g). (27.83) was recorded in treatment T_8 (1/3 Corm+GA_3 @ 400ppm).

Growth regulators like GA3, which promotes the crop growth by enhanced cell division and enlargement, leading to proper shoot and root growth that ultimately favours of maximum number of spikes and increased spikes yield. Results are in consonance with the findings of (Pathak, G. 2007) and (Singh, B *et al*., 2007). GA3 causes more splitting and cell division than increasing the size of corms (Baskaran et al., 2009) in gladiolus. Khan *et al*. (2012) found that higher concentrations of GA3 enhanced multiple shooting and accelerated corm production in gladiolus. The result is in conformity with the work of Raju (2008) in lilies and Rajaram *et al*. (2002) in gladiolus. GA3 promoted the sink activity of developing corms and cormels at the expense of flower spike, this might be the reason for increase in number of corms and cormels and quality flower spikes. Similar results were also observed by Tawar *et al*. (2007) in gladiolus

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Table1: Effect of cut corms and different growth regulators on growth parameters of gladiolus

Treatment	Plant height(cm) 90 DAS	No. of leaves per plant 90 DAS	Days to spike emergence	Days to opening of first Floret	First floret Durability
T_0 Full corm (no chemical)	111	6.53	68.36	90.80	3.67
T_1 ½ corm (no chemical)	104.03	6.33	61.63	82.37	3.20
T_2 1/3 corm (no chemical)	100.66	5.8	72	79.83	3.17
T_3 GA_3 @ 150 ppm (full corm)	115.16	6.03	68.33	93.89	4.00
T_4 GA_3 @ 200 ppm (1/2corm)	109.16	5.5	74.4	86.20	3.23
T_5 GA_3@ 250 ppm (1/3corm)	98.16	6.33	65.06	77.03	3.13
T_6 GA_3 @ 300 ppm (full corm)	107.83	5.43	77.96	82.50	3.10
T_7 GA_3 @ 350 ppm (1/2corm)	93.83	5.23	75.2	76.70	3.07
T_8 GA_3 @ 400 ppm (1/3 corm)	91.2	6.63	78.46	76.03	3.00
F- test	S	S	S	S	S
S.Em.(±)	0.63	0.11	1.03	0.52	0.07
C.D. at 5 %	1.85	0.33	3.02	1.54	0.20
C.V	1.41	4.37	3.34	1.47	4.87

Table2: Effect of cut corms and different growth regulators on flowering and yield parameters of gladiolus

Treatment	FLOWERING PARAMETERS					YIELD PARAMETERS				
	Rachis length (cm)	No. of florets/spike	Spike length (cm)	Floret Diameter (cm)	Floret Length (cm)	No. of spike/ha (lakh)	No. of Cormlet/plant	No. of corms/plant	Weight of Corms/plot (g)	Corm Yield/ha (kg)
T0	42.6	13.8	67.67	7.93	11.7	182700	11.83	2.07	35.53	790
T1	41.93	9.7	64.50	7.63	10.96	155700	10.50	1.83	31.57	700
T2	41.9	9.43	64.17	7.56	10.8	146700	9.83	1.73	29.60	690
T3	42.83	14.43	68.97	7.96	11.9	207000	14.00	2.17	36.00	1200
T4	42.3	13.53	66.90	7.8	11.4	171000	11.50	1.97	33.87	900
T5	41.83	9.33	62.33	7.5	10.66	144000	8.50	1.67	29.00	600
T6	41.96	11.46	66.30	7.66	11.16	140400	11.10	1.90	33.20	800
T7	41.16	8.8	62.00	7.33	10.4	122400	7.83	1.60	28.00	590
T8	40.5	7.96	61.00	7.3	10.26	113400	7.50	1.57	27.83	450
F- test	S	S	S	S	S	S	S	S	S	S
S.Em. (±)	0.25	0.22	0.49	0.03	0.08	1.82700	0.29	0.06	0.42	0.22
C.D. at 5 %	0.75	0.67	1.46	0.11	0.23	1.55700	0.84	0.18	1.23	0.65
C.V	1.41	4.84	1.77	1.13	1.68	1.46700	6.40	7.93	3.07	2.52

4. CONCLUSION

From the present investigation, it is concluded that, treatment T3(GA_3@150ppm+full corm) gave the best performance in terms of growth, flowering and corm production.

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