Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1002.241>

Effect of Plant Growth Regulators (GA₃, NAA and BA) on Growth and Flowering of Gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity

Anant Ram Singh^{1*}, Satendra Kumar¹, Rehan² and Deepti Jha³

¹Department of Horticulture, College of Agriculture, Sardar Vallabhbhai Patel University of Agri. and Tech. Meerut, Uttar Pradesh, India

²Department of Horticulture, College of Agriculture, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, Madhya Pradesh, India

³Department of Plant Pathology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

*Corresponding author

ABSTRACT

Keywords

Gladiolus, Plant growth regulators, Corm dipping, Spraying and corm dipping + foliar spraying

Article Info

Accepted:
17 January 2021
Available Online:
10 February 2021

The present investigation entitled “Effect of plant growth regulators on growth and flowering characters of gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity” was conducted at Horticulture Research Center (HRC), College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut-250110 (U.P.) during the *rabi* season of 2018-2019. The investigation revealed that plant growth regulators showed significant results on gladiolus as GA₃ at 400 ppm or 800 ppm concentration was significantly superior to other treatments in improving the growth, days of sprouting, plant height, length of longest leaf, number of days required for visibility of first spike, days required for opening of first floret, diameter of spike, number of florets per spike, diameter of floret, longevity of spike. NAA at 200, 400 and 600 ppm increases the number of leaves per plant, plant height. When the different treatments of application were compared, it was found that corm dipping + foliar spraying treatment was significantly superior to control.

Introduction

Gladiolus (*Gladiolus hybridus* Hort.) is an ornamental cormelous plant native to South Africa. It belongs to monocot family Iridaceae

and sub-family Ixioideae. Iridaceae family contains some 106 genera, containing mostly bulbous ornamentals. Gladiolus takes its name from latin word ‘*Gladius*’ because of sword like shape, therefore this is also known as

‘Sword lily’. *Gladiolus* is grown as flower bed in gardens and used in floral arrangements for interior decoration as well as making high quality bouquets (Lepcha *et al.*, 2007).

Gladiolus is cultivated in most of the tropical and subtropical countries of the world. Its spikes takes 60 to 100 days after planting to be harvested depending upon the cultivars and time of year (Jenkins *et al.*, 1970). The major *gladiolus* growing area in India are Kalimpong (West Bengal), New Delhi, Srinagar, Jammu & Kashmir, Pune, Ludhiana, Bengaluru and Uttarakhand.

This phenomenal growth of floriculture in India during the last couple of decade has led the world floriculture experts to visualize for country as major player in floriculture trade in future.

To enhance yield and quality of any flower crop various cultural management practices like good planting material, suitable time of planting, spacing, irrigation included plant protection measure are required. The planting material corm is important factor, which governs the growth and development of *gladiolus*. Plant growth regulators or phytohormones are organic substances produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its Place of production and active in minute amounts. The application of plant growth regulators is one of the most important factors in improving the growth, yield and flower quality (Nuvalé *et al.*, 2010).

Gibberellic acids has an important role in different plant processes, including seed germination, stem elongation, leaf expansion and flower development (Olszewski *et al.*, 2002) and was found highly effective for increasing the sprouting percentage of corm, increased cormel production and cormel size in *gladiolus* (Padmalatha *et al.*, 2013).

Materials and Methods

An experiment was conducted at Horticulture Research Centre of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (UP) during the *rabi* season (October 2018-April 2019). The experiment was laid out in randomized block design (RBD) with 28 treatments in three replications. The growth regulators viz., GA₃, NAA and BA were used each at three different concentrations applied as corm dipping, foliar spraying and corm dipping + foliar spraying. A control of untreated corms was also maintained with three replications. The experimental field was prepared by repeated tractor plough followed by harrowing. Weeds and crop residue were removed and the land was levelled. Thus pulverized field was later divided into plots.

Irrigation channel, bunds and path were left around the experimental field according to the requirement. Analysis for estimation of growth and flowering characters was done.

Vegetative growth characters

Growth observations were measured at 30, 60, and 90, days after planting of corms. For getting the sharp results of following growth observations, four plants were selected in each plot mean values of the observations were expressed for representing of each treatment separately.

Days of sprouting

The days of sprouting of corms were recorded from the day after planting. The mean of the days of sprouting was obtain by some days of sprouting of four randomly selected plants and further average value was calculated.

Plant height (cm)

The height of the plant was measured from the soil surface to the tip of the longest leaves

with the help of meter scale at 30, 60 and 90 days after planting and their average was worked out.

Number of leaves per plant

The total number of leaves in four plants in each plot was counted at 30, 60, and 90 days after planting then average was worked out.

Length of longest leaf (cm)

The length of the longest leaf was measured with the help of meter scale of selected plants at 30, 60, and 90 days interval and average leaf length was calculated.

Flowering characters

The measure the flowering performance only those plants were observed in each plot, which were measured for the performance of vegetative growth. Here also mean values of the observations were expressed for representing of each treatment separately. The flowering observations recorded are as follows.

Days required for visibility of first spike (Days)

Days required for the visibility of first spike were counted from the date of planting of the corms.

Days required for opening of first floret (Days)

Days required for opening of first flower were counted from the date of planting of the corms.

Number of florets per spike

The numbers of florets per spike were counted and mean values were expressed.

Diameter of floret (cm)

The diameter of floret was measured with the help of vernier calipers and mean values were expressed in cm.

Diameter of spike (cm)

Diameter of spike was measured with the help of Vernier calipers and mean values were expressed in cm.

Number of spikes per plant

The number of the spikes per plant was counted and means values were expressed.

Longevity of spike (Days)

The longevity of spike was observed in the field. The data were recorded from first flower bud opening to last flower faded and mean values were expressed.

Statistical analysis

The experimental data were analyzed statistically by the techniques of analysis of variance described by Snedecor and Cochran (1967).

The significance of the treatments was tested with the help of “F” (variance ratio) test. Critical difference was calculated by the following formula.

$$CD \text{ at } 5\% = \frac{\sqrt{2EMS} \times t}{r}$$

Where, CD = Critical difference

EMS = Error means sum of square

r = Number of replications

t = t value at 5% level of significance at error degree of freedom.

Results and Discussion

Vegetative growth characters

The data pertaining to the days of sprouting as presented in table 1 showed that the minimum days taken to sprouting of corms (10.28) were recorded under the treatments of GA₃ at 800ppm while maximum days taken to sprouting of corms (14.67) were recorded under the control. Similar results with the application of GA₃ have been also reported by Kirad *et al.*, (2001), Sharma *et al.*, (2006) and Kumar *et al.*, (2009) in gladiolus.

Out of the growth regulating chemicals the maximum plant height (95.53 cm) was observed under the treatment GA₃ at 400ppm applied as corm dipping alone whereas, the minimum plant height *i.e.* (86.40 cm) was found under the control. This observation on increase in the plant height with the application of GA₃ are in agreement with the findings of Kirad *et al.*, (2001), Prasad *et al.*, (2002), Tawar *et al.*, (2002) and Kumar *et al.*, (2005) in gladiolus.

It is also clear from the data that maximum number of leaves per plant *i.e.* (5.66) were recorded under treatment of GA₃ at 400ppm applied as corm dipping alone whereas, the minimum number of leaves per plant (5.19) was recorded under control. The findings are in conformity with the observation of Kirad *et al.*, (2001), Kumar *et al.*, (2005) in gladiolus.

It is evident from the data that the significantly maximum length of the leaf per plant (57.23 cm) was recorded under the treatment GA₃ at 800ppm applied as corm dipping + foliar spraying whereas, the minimum length of the leaf was recorded to be (50.25 cm) under control. Similar increases in the length of the

leaf with application of GA₃ have been also reported by Gaur *et al.*, (2003), Rana *et al.*, (2005) and Sharma *et al.*, (2006) in gladiolus (Table 2–4).

Flowering characters

The data on days taken to the number of days required for the visibility of first spike from the date of planting of corms as presented in table 5 that the minimum days taken for visibility of first spike (86.54) were found under the treatment BA at 25ppm applied as foliar spraying followed and the maximum days taken for visibility of first spike (87.59) under the BA treatment at 100ppm applied as corm dipping + foliar spraying alone. Similar results on the visibility of first spike with the application of BA have been also reported by Mahesh and Misra (1993) in gladiolus. Significantly, minimum number of days taken to complete opening of first floret on the spike (89.71) noted under the GA₃ treatment at 800ppm applied as corm dipping + foliar spraying alone.

However, the maximum number of days taken to complete opening of first floret on the spike from the date of planting were observed to be (100.81) under the control. An early flowering in gladiolus with the application of GA₃ has been also reported by Ravidas *et al.*, (1992), Kumar *et al.*, (2008) and Chaudhary *et al.*, (2018) in gladiolus (Table 6).

The data in the given table 7 clearly reveals that the maximum numbers of spikes per plant (1.080) were observed under the treatment GA₃ at 400ppm applied as foliar spraying and the minimum number of spikes per plant (1.017) was recorded under treatment BA at 100ppm applied as corm dipping alone.

Table.1 Effect of plant growth regulators on days taken to sprouting of corms in gladiolus cv. White Prosperity

S. No.	Treatments	Days of sprouting
1.	Control	14.67
	Corm dipping	
2.	GA ₃ 200 ppm	11.34
3.	GA ₃ 400 ppm	11.33
4.	GA ₃ 800 ppm	10.28
5.	NAA 200 ppm	10.40
6.	NAA 400 ppm	10.78
7.	NAA 600 ppm	11.43
8.	BA 25 ppm	12.33
9.	BA 50 ppm	12.46
10.	BA 100 ppm	14.25
	Foliar spraying	
11.	GA ₃ 200 ppm	14.20
12.	GA ₃ 400 ppm	14.25
13.	GA ₃ 800 ppm	14.51
14.	NAA 200 ppm	14.51
15.	NAA 400 ppm	13.65
16.	NAA 600 ppm	14.23
17.	BA 25 ppm	14.20
18.	BA 50 ppm	14.44
19.	BA 100 ppm	13.45
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	11.35
21.	GA ₃ 400 ppm	11.31
22.	GA ₃ 800 ppm	10.23
23.	NAA 200 ppm	10.38
24.	NAA 400 ppm	10.77
25.	NAA 600 ppm	11.46
26.	BA 25 ppm	12.46
27.	BA 50 ppm	12.51
28.	BA 100 ppm	14.22
	C.D. at 5%	0.17
	SE(m)±	0.06

Table.2 Effect of plant growth regulators on plant height (cm) at different growth stages in gladiolus cv. White Prosperity

S. No.	Treatments	Plant Height (cm)		
		30 DAP	60 DAP	90 DAP
1.	Control	40.40	60.61	86.40
	Corm dipping			
2.	GA ₃ 200 ppm	45.38	65.63	90.93
3.	GA ₃ 400 ppm	45.55	67.26	95.53
4.	GA ₃ 800 ppm	45.63	66.73	90.89
5.	NAA 200 ppm	45.50	65.81	89.69
6.	NAA 400 ppm	45.61	65.78	88.73
7.	NAA 600 ppm	45.53	65.83	90.48
8.	BA 25 ppm	45.63	68.84	90.83
9.	BA 50 ppm	45.61	66.88	88.74
10.	BA 100 ppm	45.66	66.80	88.90
	Foliar Spraying			
11.	GA ₃ 200 ppm	45.80	67.73	90.70
12.	GA ₃ 400 ppm	45.20	65.63	89.58
13.	GA ₃ 800 ppm	45.45	66.56	90.73
14.	NAA 200 ppm	46.72	66.91	89.33
15.	NAA 400 ppm	45.90	67.13	88.17
16.	NAA 600 ppm	46.80	66.60	90.39
17.	BA 25 ppm	46.63	67.26	87.69
18.	BA 50 ppm	46.73	67.36	86.77
19.	BA 100 ppm	46.35	67.81	90.72
	Corm dipping + foliar spraying			
20.	GA ₃ 200 ppm	46.45	69.21	91.43
21.	GA ₃ 400 ppm	46.53	69.30	90.39
22.	GA ₃ 800 ppm	46.62	68.82	90.70
23.	NAA 200 ppm	46.85	69.25	92.60
24.	NAA 400 ppm	47.62	70.17	92.95
25.	NAA 600 ppm	46.42	70.20	90.56
26.	BA 25 ppm	47.84	70.33	90.83
27.	BA 50 ppm	46.85	70.35	89.34
28.	BA 100 ppm	46.90	70.43	90.65
	C.D. at 5%	0.12	0.22	1.13
	SE(m)±	0.04	0.07	0.40

Table.3 Effect of plant growth regulators on number of leaves per plant in gladiolus cv. White Prosperity

S. No.	Treatments	Number of leaves per plant		
		30 DAP	60 DAP	90 DAP
1.	Control	2.33	4.13	5.19
	Corm dipping			
2.	GA ₃ 200 ppm	2.67	4.52	5.47
3.	GA ₃ 400 ppm	2.88	4.54	5.66
4.	GA ₃ 800 ppm	2.96	4.56	5.37
5.	NAA 200 ppm	2.64	4.56	5.30
6.	NAA 400 ppm	2.67	4.90	5.62
7.	NAA 600 ppm	2.68	4.96	5.38
8.	BA 25 ppm	2.85	4.92	5.41
9.	BA 50 ppm	2.94	4.91	5.30
10.	BA 100 ppm	2.97	4.95	5.43
	Foliar Spraying			
11.	GA ₃ 200 ppm	2.91	4.62	5.36
12.	GA ₃ 400 ppm	2.93	4.65	5.38
13.	GA ₃ 800 ppm	2.95	4.67	5.62
14.	NAA 200 ppm	2.95	4.93	5.60
15.	NAA 400 ppm	2.97	4.96	5.39
16.	NAA 600 ppm	2.97	4.98	5.37
17.	BA 25 ppm	2.85	4.95	5.25
18.	BA 50 ppm	2.92	4.95	5.24
19.	BA 100 ppm	2.95	4.96	5.34
	Corm dipping + foliar spraying			
20.	GA ₃ 200 ppm	2.96	4.55	5.40
21.	GA ₃ 400 ppm	2.98	4.60	5.44
22.	GA ₃ 800 ppm	2.95	4.63	5.30
23.	NAA 200 ppm	2.87	4.50	5.40
24.	NAA 400 ppm	2.90	4.53	5.50
25.	NAA 600 ppm	2.93	4.59	5.56
26.	BA 25 ppm	2.97	4.30	5.34
27.	BA 50 ppm	2.98	4.35	5.64
28.	BA 100 ppm	2.97	4.36	5.36
	C.D. at 5%	0.026	0.047	0.041
	SE(m)±	0.009	0.016	0.015

Table.4 Effect of plant growth regulators on length of longest leaf (cm) in gladiolus cv. White Prosperity

S. No.	Treatments	Length of longest leaf (cm)		
		30 DAP	60 DAP	90 DAP
1.	Control	25.17	43.40	50.25
	Corm dipping			
2.	GA ₃ 200 ppm	26.32	44.92	54.37
3.	GA ₃ 400 ppm	26.38	44.81	55.79
4.	GA ₃ 800 ppm	26.39	45.25	56.65
5.	NAA 200 ppm	25.73	44.28	53.38
6.	NAA 400 ppm	25.79	44.59	55.33
7.	NAA 600 ppm	25.81	44.63	55.20
8.	BA 25 ppm	25.84	44.89	53.72
9.	BA 50 ppm	25.87	44.92	55.42
10.	BA 100 ppm	25.92	44.95	53.73
	Foliar spraying			
11.	GA ₃ 200 ppm	26.17	44.92	54.45
12.	GA ₃ 400 ppm	25.91	45.86	55.93
13.	GA ₃ 800 ppm	26.15	45.93	56.83
14.	NAA 200 ppm	26.41	44.85	53.45
15.	NAA 400 ppm	26.50	45.95	55.95
16.	NAA 600 ppm	27.20	45.61	54.18
17.	BA 25 ppm	27.26	45.40	54.45
18.	BA 50 ppm	27.26	45.36	54.86
19.	BA 100 ppm	26.83	44.93	54.71
	Corm dipping + foliar spraying			
20.	GA ₃ 200 ppm	26.13	45.46	55.20
21.	GA ₃ 400 ppm	27.16	45.66	56.20
22.	GA ₃ 800 ppm	27.15	45.76	57.23
23.	NAA 200 ppm	25.73	44.93	55.52
24.	NAA 400 ppm	25.84	45.21	55.93
25.	NAA 600 ppm	25.95	45.38	54.43
26.	BA 25 ppm	25.51	44.80	51.87
27.	BA 50 ppm	25.89	44.85	55.91
28.	BA 100 ppm	25.81	44.96	51.77
	C.D. at 5%	0.06	0.17	3.18
	SE(m)±	0.02	0.06	1.12

Table.5 Effect of plant growth regulators on days required for visibility of first spike in gladiolus cv. White Prosperity

S. No.	Treatments	Days required for visibility of first spike (DAP)
1.	Control	87.93
	Corm dipping	
2.	GA ₃ 200 ppm	83.57
3.	GA ₃ 400 ppm	82.40
4.	GA ₃ 800 ppm	81.73
5.	NAA 200 ppm	86.26
6.	NAA 400 ppm	86.45
7.	NAA 600 ppm	86.65
8.	BA 25 ppm	86.75
9.	BA 50 ppm	86.57
10.	BA 100 ppm	86.84
	Foliar spraying	
11.	GA ₃ 200 ppm	84.48
12.	GA ₃ 400 ppm	84.32
13.	GA ₃ 800 ppm	84.91
14.	NAA 200 ppm	86.64
15.	NAA 400 ppm	86.13
16.	NAA 600 ppm	86.61
17.	BA 25 ppm	86.54
18.	BA 50 ppm	86.67
19.	BA 100 ppm	86.86
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	81.34
21.	GA ₃ 400 ppm	80.70
22.	GA ₃ 800 ppm	78.84
23.	NAA 200 ppm	85.92
24.	NAA 400 ppm	87.10
25.	NAA 600 ppm	87.27
26.	BA 25 ppm	87.34
27.	BA 50 ppm	87.33
28.	BA 100 ppm	87.59
	C.D. at 5%	0.40
	SE(m)±	0.14

Table.6 Effect of plant growth regulators on days required for opening of first floret in gladiolus cv. White Prosperity

S. No.	Treatments	Days required for opening of first floret (DAP)
1.	Control	100.81
	Corm dipping	
2.	GA ₃ 200 ppm	98.37
3.	GA ₃ 400 ppm	97.47
4.	GA ₃ 800 ppm	90.67
5.	NAA 200 ppm	99.45
6.	NAA 400 ppm	99.34
7.	NAA 600 ppm	99.61
8.	BA 25 ppm	99.75
9.	BA 50 ppm	100.06
10.	BA 100 ppm	100.17
	Foliar spraying	
11.	GA ₃ 200 ppm	96.55
12.	GA ₃ 400 ppm	96.28
13.	GA ₃ 800 ppm	96.81
14.	NAA 200 ppm	100.16
15.	NAA 400 ppm	99.62
16.	NAA 600 ppm	99.87
17.	BA 25 ppm	99.16
18.	BA 50 ppm	99.28
19.	BA 100 ppm	100.12
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	96.56
21.	GA ₃ 400 ppm	90.65
22.	GA ₃ 800 ppm	89.71
23.	NAA 200 ppm	99.41
24.	NAA 400 ppm	100.16
25.	NAA 600 ppm	100.05
26.	BA 25 ppm	100.03
27.	BA 50 ppm	99.91
28.	BA 100 ppm	99.95
	C.D. at 5%	0.34
	SE(m)±	0.12

Table.7 Effect of plant growth regulators on number of spike per plant in gladiolus cv. White Prosperity

S. No.	Treatments	Number of spike per plant
1.	Control	1.000
	Corm dipping	
2.	GA ₃ 200 ppm	1.023
3.	GA ₃ 400 ppm	1.033
4.	GA ₃ 800 ppm	1.043
5.	NAA 200 ppm	1.040
6.	NAA 400 ppm	1.047
7.	NAA 600 ppm	1.043
8.	BA 25 ppm	1.053
9.	BA 50 ppm	1.060
10.	BA 100 ppm	1.017
	Foliar spraying	
11.	GA ₃ 200 ppm	1.060
12.	GA ₃ 400 ppm	1.080
13.	GA ₃ 800 ppm	1.070
14.	NAA 200 ppm	1.053
15.	NAA 400 ppm	1.063
16.	NAA 600 ppm	1.067
17.	BA 25 ppm	1.030
18.	BA 50 ppm	1.040
19.	BA 100 ppm	1.050
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	1.053
21.	GA ₃ 400 ppm	1.013
22.	GA ₃ 800 ppm	1.067
23.	NAA 200 ppm	1.063
24.	NAA 400 ppm	1.070
25.	NAA 600 ppm	1.047
26.	BA 25 ppm	1.050
27.	BA 50 ppm	1.053
28.	BA 100 ppm	1.050
	C.D. at 5%	0.029
	SE(m)±	0.010

Table.8 Effect of plant growth regulators on number of floret per spike in gladiolus cv. White Prosperity

S. No.	Treatments	Number of floret per spike
1.	Control	10.72
	Corm dipping	
2.	GA ₃ 200 ppm	12.71
3.	GA ₃ 400 ppm	13.27
4.	GA ₃ 800 ppm	14.27
5.	NAA 200 ppm	11.20
6.	NAA 400 ppm	11.75
7.	NAA 600 ppm	11.81
8.	BA 25 ppm	10.94
9.	BA 50 ppm	10.83
10.	BA 100 ppm	10.85
	Foliar spraying	
11.	GA ₃ 200 ppm	11.51
12.	GA ₃ 400 ppm	12.66
13.	GA ₃ 800 ppm	13.65
14.	NAA 200 ppm	11.33
15.	NAA 400 ppm	11.30
16.	NAA 600 ppm	11.48
17.	BA 25 ppm	10.83
18.	BA 50 ppm	10.88
19.	BA 100 ppm	10.92
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	11.37
21.	GA ₃ 400 ppm	12.49
22.	GA ₃ 800 ppm	11.34
23.	NAA 200 ppm	11.75
24.	NAA 400 ppm	11.73
25.	NAA 600 ppm	11.83
26.	BA 25 ppm	10.75
27.	BA 50 ppm	10.82
28.	BA 100 ppm	10.84
	C.D. at 5%	0.15
	SE(m)±	0.05

Table.9 Effect of plant growth regulators on diameter of floret (cm) in gladiolus cv. White Prosperity

S. No.	Treatments	Diameter of floret (cm)
1.	Control	11.25
	Corm dipping	
2.	GA ₃ 200 ppm	11.86
3.	GA ₃ 400 ppm	12.82
4.	GA ₃ 800 ppm	11.54
5.	NAA 200 ppm	11.41
6.	NAA 400 ppm	11.45
7.	NAA 600 ppm	11.31
8.	BA 25 ppm	11.32
9.	BA 50 ppm	11.37
10.	BA 100 ppm	11.48
	Foliar spraying	
11.	GA ₃ 200 ppm	11.67
12.	GA ₃ 400 ppm	11.37
13.	GA ₃ 800 ppm	11.54
14.	NAA 200 ppm	11.60
15.	NAA 400 ppm	11.65
16.	NAA 600 ppm	11.58
17.	BA 25 ppm	11.25
18.	BA 50 ppm	11.37
19.	BA 100ppm	11.39
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	11.61
21.	GA ₃ 400 ppm	11.78
22.	GA ₃ 800 ppm	11.42
23.	NAA 200 ppm	11.33
24.	NAA 400 ppm	11.40
25.	NAA 600 ppm	11.36
26.	BA 25 ppm	11.37
27.	BA 50 ppm	11.41
28.	BA 100 ppm	11.51
	C.D. at 5%	0.13
	SE(m)±	0.04

Table.10 Effect of plant growth regulators on diameter of spike (cm) in gladiolus cv. White Prosperity

S. No.	Treatments	Diameter of spike (cm)
1.	Control	0.800
	Corm dipping	
2.	GA ₃ 200 ppm	0.867
3.	GA ₃ 400 ppm	0.887
4.	GA ₃ 800ppm	0.837
5.	NAA 200 ppm	0.827
6.	NAA 400 ppm	0.853
7.	NAA 600 ppm	0.867
8.	BA 25 ppm	0.883
9.	BA 50 ppm	0.837
10.	BA 100 ppm	0.853
	Foliar spraying	
11.	GA ₃ 200 ppm	0.853
12.	GA ₃ 400 ppm	0.863
13.	GA ₃ 800 ppm	0.837
14.	NAA 200 ppm	0.863
15.	NAA 400 ppm	0.880
16.	NAA 600 ppm	0.870
17.	BA 25 ppm	0.870
18.	BA 50 ppm	0.857
19.	BA 100ppm	0.850
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	0.870
21.	GA ₃ 400 ppm	0.867
22.	GA ₃ 800 ppm	0.843
23.	NAA 200 ppm	0.847
24.	NAA 400 ppm	0.850
25.	NAA 600 ppm	0.873
26.	BA 25 ppm	0.853
27.	BA 50 ppm	0.837
28.	BA 100 ppm	0.843
	C.D. at 5%	0.029
	SE(m)±	0.010

Table.11 Effect of plant growth regulators on longevity of spike (Days) in gladiolus cv. White Prosperity

S. No.	Treatments	Longevity of spike (Days)
1.	Control	12.95
	Corm dipping	
2.	GA ₃ 200 ppm	15.49
3.	GA ₃ 400 ppm	16.81
4.	GA ₃ 800 ppm	17.48
5.	NAA 200 ppm	13.59
6.	NAA 400 ppm	14.26
7.	NAA 600 ppm	14.27
8.	BA 25 ppm	14.44
9.	BA 50 ppm	15.44
10.	BA 100 ppm	15.52
	Foliar spraying	
11.	GA ₃ 200 ppm	15.25
12.	GA ₃ 400 ppm	16.38
13.	GA ₃ 800 ppm	15.87
14.	NAA 200 ppm	13.92
15.	NAA 400 ppm	14.71
16.	NAA 600 ppm	15.86
17.	BA 25 ppm	14.95
18.	BA 50 ppm	15.36
19.	BA 100 ppm	15.45
	Corm dipping + foliar spraying	
20.	GA ₃ 200 ppm	14.92
21.	GA ₃ 400 ppm	15.81
22.	GA ₃ 800 ppm	16.37
23.	NAA 200 ppm	13.69
24.	NAA 400 ppm	14.72
25.	NAA 600 ppm	15.49
26.	BA 25 ppm	15.11
27.	BA 50 ppm	15.44
28.	BA 100 ppm	15.52
	C.D. at 5%	0.25
	SE(m)±	0.08

Similar results of alemaximum number of spikes with foliar spraying has been also reported by Chopde *et al.*, (2013) and Yadav and Bhatia (2018) in gladiolus. The data on the number of florets per spike as presented in table 8 showed that the maximum number of florets per spike

(14.27) was observed under the treatment GA₃ at 800ppm applied as corm dipping while the minimum number of spikes per plant (1.00) was obtained under the control. Similar increases in the number of florets with the application of GA₃ have been also reported by Prasad *et al.*,

(2002), Gaur *et al.*, (2003), Kumar and Singh (2005) and Chaudhary *et al.*, (2018) in gladiolus.

The diameter of florets (11.25cm) was noted significantly lower (11.86 cm) under control. Out of growth regulators treatments, the significantly greater diameter of florets (12.82cm) was observed under the treatments GA₃ at 400ppm applied as corm dipping alone. These results are in close conformity with the findings of Ram *et al.*, (2001), Aier *et al.*, (2015) and Chaudhary *et al.*, (2018) in gladiolus (Table 9).

It is evident from the data that the diameter of spike (0.800cm) was registered minimum under the control while the maximum diameter of the spike (0.887cm) was found under the treatment GA₃ at 400ppm concentration applied as corm dipping alone. The similar results have been also reported by Attia *et al.*, (2001) and Chopde *et al.*, (2013) in gladiolus (Table 10).

The longevity of (12.95 days) was recorded under control. Out of the growth regulating chemicals (Table 11), the significantly maximum longevity of spike (17.48 days) was obtained under the treatment of GA₃ at 800ppm applied as corm dipping alone. The favorable effects of GA₃ application in promoting the longevity of whole spike have also been reported by Ram *et al.*, (2001), Gaur *et al.*, (2003) and Kumar and Singh (2005) in gladiolus.

On the basis of above finding, it can be concluded that GA₃ at 400 ppm or 800 ppm concentration was significantly superior to other treatments in improving the growth, days of sprouting, plant height, length of longest leaf, number of days required for visibility of first spike, days required for opening of first floret, diameter of spike, number of florets per spike, diameter of floret, longevity of spike. NAA at 200, 400 and 600 ppm increases the number of leaves per plant, plant height. When the different treatments of application were compared, it was found that corm dipping + foliar spraying

treatment was significantly superior to other treatments.

References

- Aier, S., Langthasa, S., Hazarika, D. N., Gautam, B. P. and Goswami, R. K. (2015). Influence of GA₃ and BA on morphological, phenological and yield attributes in gladiolus cv. Red Candyman. *Journal of Agriculture and Veterinary Science*, 8(6): 37-42.
- Attia, F. A. (2001). The response of gladiolus (*Gladiolus hybridus* Hort.) cv. Rose Supreme, to different growth substances with different methods of application. *Annals of Agricultural Science*, 39(3): 169-171.
- Chaudhary, P., Moond, S. K. and Bola, P. (2018). Effect of bioregulators on vegetative growth and flower production of gladiolus (*Gladiolus hybridus* Hort.). *International Journal of Current Microbial Applied Science*, 7: 463-470.
- Chopde, N., Gonge, V. S. and Warade, A. D. (2013). Influence of growth regulators on gladiolus varieties. *Journal of Agriculture Research and Technology*, 38(3): 369-374.
- Gaur, G. S. Chaudhary, T. C. and Trivedi, J. D. (2003). Effect of GA₃ and IAA on growth, flowering and corm production in gladiolus cv. Eurovision. *Journal of Farm Science*, 12(1): 1-3.
- Jenkins, J. M., Milholland, R. D., Lilly, J. P. and Beute, M. K. (1970). Commercial gladiolus production in North Carline. *North Carolina Agriculture Extension Circle*, 44: 1-34.
- Kirad, K. S., Banafar, R. N. S., Barche, S., Billore, M. and Meenakshi, D. (2001). Effect of growth regulators on gladiolus. *Annals of Agricultural Research*, 22(2): 278-281.
- Kumar, P. S., Bhagawati, R., Kumar, R. and Ronya, T. (2008). Effect of plant growth regulators on vegetative growth, flowering and corm production of

- gladiolus in Arunachal Pradesh. *Journal of Ornamental Horticulture*, 11(4): 265-270.
- Kumar, S. K., Chandrashekar, R., Padma, M. and Shivshankar, A. (2009). Effect of plant growth regulators on dormancy, corm and cormel production in gladiolus. *Journal of Ornamental Horticulture*, 12: 182-187.
- Kumar, V. and Singh, R. P. (2005). Effect of soaking of mother corms with plant growth regulators on vegetative growth, flowering and corm production in gladiolus. *Journal of Ornamental Horticulture*, 8(4): 306-308.
- Lepcha, B., Nautiyal, M. C. and Rao, V. K. (2007). Variability studies in gladiolus under mid hill conditions of Uttarakhand. *Journal of Ornamental Horticulture*, 10(1): 169-172.
- Mahesh, K. S. and Misra, R. L. (1993). Effect of growth regulators on gladiolus. *Journal of Ornamental Horticulture*, 1(2): 12-15.
- Nuvalé, M. U., Aklade, S. A., Desai J. R. and Nannvare, P. V. (2010). Influence of plant growth regulators on growth, flowering and yield of chrysanthemum cv. 'IIHR-6. *International Journal of Pharma Bio Science*, 1: 1-4.
- Olszewski, N., Sun, T. P. and Gubler, F. (2002). Gibberellins signaling: Biosynthesis, catabolism and response pathways. *Plant Cell*, 14: 61-80.
- Padmalatha, T., Reddy, G. S., Chandrasekhar, R., Shankar, A. S. and Chaturvedi, A. (2013). Effect of pre-planting soaking of corms with chemicals and plant growth regulators on dormancy breaking and corm and cormel production in gladiolus. *International Journal of Plant, Animal and Environmental Science*, 3(1): 28-33.
- Prasad, A., Kumar, R., Arya, S. and Saxena, K. (2002). Varietal response of gladiolus corms to GA₃ dipping. *Journal of Ornamental Horticulture*, 5(1): 69-70.
- Ram, D., Verma, J. P. and Verma, H. K. (2001). Effect of plant growth regulators on vegetative growth of gladiolus. *Annals of Agriculture Biology Research*, 6(1): 81-84.
- Rana, P., Kumar, J. and Kumar, M. (2005). Response of GA₃, plant spacing and planting depth on growth, flowering and corm production in gladiolus. *Journal of Ornamental Horticulture*, 8(1): 41-44.
- Ravidas, L., Rajeevan, P. K. and Valsalakumari, P. K. (1992). Effect of foliar application of growth regulators on the growth, flowering and corm yield of gladiolus cv. Friendship. *South Indian Horticulture*, 40(6): 329-335.
- Sharma, D. P., Chattar, Y. K. and Nishith, G. (2006). Effect of gibberellic acid on growth, flowering and corm yield in three cultivars of gladiolus. *Journal of Ornamental Horticulture*, 9(2): 106-109.
- Snedecor, G. W. and Cochran, W. G. (1967). Statistical Methods. *The Iowa State University Press*, 308-310.
- Tawar, R. V., Sable, A. S. and Giri, M. D. (2002). Effect of growth regulators on growth and flowering of gladiolus cv. Jester. *Annals of Plant Physiology*, 16(2): 109-111.
- Yadav, S. and Bhatia, S. K. (2018). Effect of plant growth regulators on sprouting, vegetative characters, flowering and corm production in *Gladiolus* sp. cv. Sancerre. *International Journal of Pure Applied Bio Science*, 6(2): 1142-1147.

How to cite this article:

Anant Ram Singh, Satendra Kumar, Rehan and Deepti Jha. 2021. Effect of Plant Growth Regulators (GA₃, NAA and BA) on Growth and Flowering of Gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity. *Int.J.Curr.Microbiol.App.Sci*. 10(02): 2008-2024.
doi: <https://doi.org/10.20546/jcmas.2021.1002.241>