

# EFFECT OF GROWTH REGULATORS ON PLANT GROWTH AND CORMEL PRODUCTION OF GLADIOLUS

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## ABSTRACT

The present investigation was undertaken in the experimental field area of Floriculture and Landscaping, Punjab Agricultural University, Ludhiana, during 2015-2016. The cormels of four varieties of gladiolus namely CPG, Punjab Glance, Sylvia and Novalux were treated with gibberellic acid (50, 100, 150 and 200 ppm) and benzyladenine (25, 50, 75, 100, 125 ppm) as pre planting dip treatment for 12 hours. The analysis of variance was conducted as per factorial randomized block design. The result revealed various parameters like minimum time to sprouting of cormels was recorded with gibberellic acid 200 ppm and maximum sprouting percent, plant height(cm), leaf length(cm), width(cm), area(cm<sup>2</sup>), no of leaves/plant, cormels, diameter, weight of cormels was recorded with gibberellic acid 200 ppm followed by BA 125 ppm.

## INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.) is an important bulbous flower and plays an important role as cut flower both in domestic and international market. Plant growth regulators are the organic chemical compounds which modify or regulate physiological processes in an appreciable measure by breaking dormancy of gladiolus corms and stimulating cell division and cell elongation in plants (Nuvalé *et al.*, 2010). Gibberellic acid has an important role in different plant processes, including seed germination, stem elongation, leaf expansion and flower development (Olszewski *et al.*, 2002). Gibberellic acid was found highly effective for increasing the sprouting percentage of corm, increased cormel production and cormel size in gladiolus (Neetu and Kumar 2016). Benzyladenine is also a cytokinin and its application is reported in different ornamental bulbous plants Benzyladenine is also a cytokinin and its application is reported in different ornamental bulbous plants. As the small cormels take 2-3 years to produce flowering grade corms, hence the plant growth regulators can play a definite role to enhance plant growth and ultimately to shorten the cycle and increase the cormel production (Sajjad *et al.*, 2015). Hence the present study was undertaken to find the optimum concentration of GA3 and BA for dip treatment of gladiolus cormels and to determine the effect of GA3 and BA on growth and cormel production of various gladiolus varieties under the agro-ecological conditions of Ludhiana, Punjab.

## MATERIALS AND METHODS

The present investigation was conducted at the research farm,

Department of Floriculture and Landscaping, Punjab Agricultural University, Ludhiana, during 2015-2016 and arranged in Randomized Block Design in three Replications. The cormels of four gladiolus varieties viz CPG, Punjab Glance, Sylvia and Novalux were treated with Bavistin @ (0.2%), Gibberellic acid (50, 100, 150 and 200 ppm) and Benzyladenine (25, 50, 75, 100, 125 ppm) as pre planting dip treatment for 12 hours and planted 1st week of November at spacing of 20×10cm. Regular cultural practices like weeding, irrigation fertilization etc were followed throughout the experiment to raise the crop as per recommendations. The varieties were evaluated for different vegetative characteristics like Days to cormel sprouting, Plant height(cm), leaf length(cm), leaf width(cm), Area(cm<sup>2</sup>), No of leaves per plant, No of cormels, Cormels diameter, Weight. Cormels were lifted in the month of April. The data statistically analysed by using CPCS-1, using standard technique of analysis of variance (Anova) technique (Steel *et al.*, 1997) at CD value of five percent to find out significant difference existed amongst the varieties.

## RESULTS AND DISCUSSION

### Days to cormel sprouting

Data presented in table 1 reveals significant difference in time taken for cormel sprouting with gibberellic acid and BA treated cormels with different concentrations among different varieties. The minimum time (11.83 days) to sprouting was observed with the application of gibberellic acid 200 ppm and maximum (12.24) days with BA 125 ppm. In variety, Punjab Glance (12.53 days) minimum days to sprouting was observed

**Table 1: Effect of pre planting growth regulators treatments of cormels on growth parameters in gladiolus**

Treatment	Days to sprouting					Sprouting %				
	CPG	PG	Sylvia	Novalux	Mean	CPG	PG	Sylvia	Novalux	Mean
Control	17	14	17	18.66	16.66	83.66	85	83.33	70	80.5
GA350ppm	13.66	13.33	14.66	16.33	14.49	80.66	83	85.33	73.33	80.75
GA3100ppm	11	12	13.66	13.66	12.58	88.66	88.66	88.66	80	86.5
GA3150ppm	11.5	12	13.66	13.66	12.7	95.66	86.33	89.33	84	88.75
GA3200ppm	11	11.66	12.33	12.33	11.83	99.33	93.33	94.66	89	94.08
BA25ppm	16.33	13.66	16.33	18.33	16.16	70.33	69	70.66	68.33	69.08
BA 50 ppm	14.33	12.66	14.33	16.33	14.41	73	76	72.66	70	72.91
BA75 ppm	14.33	12.66	14.33	14.33	13.91	70.66	70	85	85.66	78.08
BA100 ppm	12.33	11.33	12.33	12.33	12.08	86.33	86	90.66	89	88.33
BA125 ppm	12.33	12	12.33	12.33	12.24	93.33	96.33	92.33	89	91.41
Mean	13.38	12.53	14.1	14.83		83.73	83.1	82.7	79.83	
CD(p = 0.05)										
Variety				0.55						1.84
Treatment				0.87						2.91
Interaction				1.74						5.82

**Table 2 : Effect of pre planting growth regulators treatments of cormels on growth parameters in gladiolus**

Treatment	CPG	Leaf Length				Mean
		Punjab Glance	Sylvia	Novalux		
T1 Control	21.43	23.9	18.5	16.2	20	
T2 GA,50ppm	20.76	24.23	21	16.66	20.66	
T3 GA,100ppm	21.2	24	21.46	16.86	20.94	
T4 GA,150 ppm	21	27.6	22.4	16.83	22.78	
T5 GA,200ppm	22.83	28.5	24.1	17.36	23.2	
T6 BA 25ppm	21	24	19.3	16.2	20.12	
T7 BA 50ppm	21.43	25.26	19.6	16.2	20.64	
T8 BA 75ppm	21.43	25.26	19.83	16.83	20.84	
T9 BA 100ppm	21.86	24	20.5	16.86	22.43	
T10 BA 125ppm	22	23.66	20.33	16.46	22.31	
Mean	21.49	26.72	20.7	16.65		
CD(p = 0.05)						
Variety					1.07	
Treatment					1.69	
Interaction					NS	

**Table 3: Effect of pre planting growth regulators treatments of cormels on growth parameters in gladiolus**

Treatment	Leaf width(cm)					Leaf area (cm <sup>2</sup> )					No of leaves per plant				
	CPG	PG	Sylvia	Nov alux	Mean	CPG	PG	Sylvia	Nov alux	Mean	CPG	PG	Sylvia	Nov alux	Mean
Control	1.96	1.83	1.63	1.43	1.71	46.89	52.9	35.33	24.34	39.87	4.19	4.5	4.03	3.16	3.89
GA350ppm	1.86	1.96	1.83	1.33	1.75	46.59	53.17	38.73	20.82	39.82	4.33	4.53	4.36	3.2	4.1
GA3100ppm	1.88	2	1.86	1.36	1.81	47.4	53.75	46.74	29.29	44.29	4.07	4.37	4.46	2.73	3.85
GA3150ppm	2.16	2.1	2.36	1.5	1.94	48.01	77.2	48.8	30.66	51.17	4.5	4.13	4.6	4	4.4
GA3200ppm	2.42	2.56	2.66	1.93	2.24	64.67	77.24	55.95	31.18	57.26	4.73	4.86	4.83	3.83	4.56
BA25ppm	1.66	1.63	1.63	1.33	1.64	39.66	51.4	30.5	21.29	35.71	4.5	4.13	4.06	3.2	3.97
BA 50 ppm	1.7	1.83	1.83	1.46	1.77	43.69	52.98	35.67	28.65	40.24	4.86	4.63	4.46	3.33	4.25
BA75 ppm	1.66	1.86	2.03	1.5	1.76	38.41	52.9	45.76	28.65	41.44	4.63	4.36	4.36	3.46	4.2
BA100 ppm	2	2.1	2.06	1.56	1.91	40.25	58.78	39.04	31.05	42.28	4.57	5.06	4.33	3.26	4.33
BA125 ppm	2	2.56	2.1	1.4	2	47.56	63.23	48.8	32.09	48.14	4.75	4.73	4.51	3.63	4.4
Mean	1.88	2.07	1.99	1.48	—	46.31	59.35	42.53	27.9	—	4.51	4.56	4.41	3.4	—
CD(p = 0.05)															
Variety				0.11				4.82						0.21	
Treatment				0.18				7.63						0.33	
Interaction				0.36				NS						NS	

followed by variety CPG (13.38 days). Among varieties highest sprouting % was recorded in CPG (83.73%), Punjab Glance (83.10%) followed by Sylvia (82.70 %). The growth regulators treatments gibberellic acid 200 ppm resulted maximum sprouting % (94.08 %) followed by BA 125 ppm (91.41%). The interactions between the varieties and treatments revealed

that, variety CPG, recorded maximum sprouting % (99.33%) with gibberellic acid 200 ppm followed by variety Punjab Glance. Similar results have been also reported by Uddin *et al.* (2013) with the application of gibberellic acid on number of sprouts per plant and vegetative parameter.

#### Plant height

**Table 4 : Effect of pre planting growth regulators treatments of cormels on growth parameters in gladiolus**

Treatment	No. Of cormels					Diameter of cormel					Cormel weight				
	CPG	PG	Sylvia	Nov alux	Mean	CPG	PG	Sylvia	Nov alux	Mean	CPG	PG	Sylvia	Nov alux	Mean
Control	1.53	2.08	1	1	1.4	1.91	2.13	1.74	1.47	1.81	5.23	8	5.33	2.06	5.15
GA350ppm	2.56	2.21	1.69	1	1.86	2.07	2.25	1.93	1.62	1.96	8.33	9.26	6.13	2.06	6.45
GA3100ppm	1.8	3.19	2.01	1.06	2.02	1.95	2.11	1.47	1.64	1.79	8.74	11.5	7.26	2.86	7.59
GA3150ppm	2.44	2.3	2.26	1.06	2.01	2	2.19	2.04	1.88	2.03	8.9	10.1	7.56	2.7	7.32
GA3200ppm	2.72	3.75	2.71	1.3	2.62	2.1	2.23	2.08	1.82	2.06	9.99	13.8	8.52	3.22	8.87
BA25ppm	2.06	2.31	1.26	0.83	1.62	2	2.28	1.21	1.29	1.69	7.35	7.04	5.08	2	5.36
BA 50 ppm	1.95	2.31	2.07	1.16	1.87	1.85	2.01	1.96	1.72	1.88	8.61	10	5.17	2.13	6.48
BA75 ppm	1.66	2.61	1.7	1	1.74	1.87	2.16	1.82	1.5	1.84	9.95	8.81	5.31	3.2	6.82
BA100 ppm	2.27	3.15	1.36	1	1.94	1.89	2.14	1.74	1.61	1.84	9.26	9.38	5.29	3.24	6.79
BA125 ppm	3.3	5.15	3.57	1.36	3.34	2.07	2.44	1.94	1.72	2.04	9.99	13.2	6.9	3.43	8.37
Mean	2.33	2.91	1.96	1.08	—	1.97	2.19	1.79	1.62	—	8.75	10.1	6.25	2.81	—
CD(p = 0.05)															
Variety					0.31					0.12					0.97
Treatment					0.49					0.19					1.54
Interaction					0.99					NS					NS

Data presented in table 2 reveals the effect on treated cormels with gibberellic acid and BA on plant height with different concentrations among different varieties.

The maximum plant height was observed in variety Punjab Glance (29.88 cm) followed by the CPG (25.70 cm) and Sylvia (23.97 cm). As per the results of different growth regulators treatments, gibberellic acid 200 ppm resulted in maximum plant height (28.05 cm) followed by gibberellic acid 50 ppm (26.57 cm). The variety CPG presented maximum (27.40 cm) plant height with BA 50 ppm. This might be due to increased cell elongation by increasing cell division in sub apical meristem and increase in vegetative parameters as reported by Bhalla and Kumar (2008) in gladiolus.

#### Leaf length

Data presented in table 2 explains the effect of Gibberlic acid and benyladenine on leaf length of different varieties of gladiolus.

Maximum leaf length was observed in Punjab Glance (26.72 cm) followed by CPG (21.49 cm) and Sylvia (20.70 cm) likewise gibberellic acid 200 ppm resulted in maximum leaf length (23.20 cm). Among the varieties CPG, presented maximum leaf length with gibberellic acid 200 ppm (22.83 cm). In variety Punjab Glance, maximum leaf length was observed with gibberellic acid 200 ppm (28.50 cm). Gibberellic acid promotes vegetative growth in terms of leaf size by inducing active cell division in apical meristem. These findings are in consonance with the reports of Sharma *et al.* (2004).

#### Leaf width and Leaf area

Data presented in Table 3 reveals significant variation in leaf width and leaf area of different gladiolus varieties.

Among the four varieties maximum leaf width was obtained in (2.07 cm) in Punjab Glance followed by Sylvia (1.99 cm) and CPG (1.88 cm). Gibberellic acid 200 ppm resulted in maximum leaf width (2.24 cm) followed by BA 125 ppm (2.00 cm). Among varieties CPG, presented maximum leaf width with gibberellic acid 200 ppm (2.42 cm). Likewise Maximum leaf area was observed in variety Punjab Glance (59.35 cm<sup>2</sup>) followed by CPG (46.31 cm<sup>2</sup>) and Sylvia (42.53 cm<sup>2</sup>). Gibberellic acid 200 ppm (57.26 cm<sup>2</sup>) resulted in maximum

leaf area and gibberellic acid 150 ppm (51.17 cm<sup>2</sup>). Among varieties CPG, presented maximum leaf area with gibberellic acid 200 ppm (64.67 cm<sup>2</sup>). There is reduction in leaf area due to BA treatments because of the effect of BA on two competitive sinks, spikes and developing cormels which enhance multiple shooting and hence accelerated corm production leading in decrease in area of leaf. Similar results have also been reported by Padmalatha *et al.* (2013) and Thakur and Dhatt (2014) in gladiolus.

#### Leaves per plant

Data presented in table 3 reveals the effect of gibberellic acid and BA on plant height with different concentrations among different varieties.

Maximum number of leaves per plant were observed in Punjab Glance (4.56) followed by CPG (4.51) and Sylvia (4.41). Gibberellic acid 200 ppm resulted maximum number of leaves per plant (4.56). Among varieties CPG, presented maximum number of leaves per plant with BA 50 ppm (4.86). These results are in accordance with the description of earlier described parameters on leaf length, leaf width and leaf area of present study similarly these results also justify the findings of Padmalatha *et al.* (2013).

#### Number of cormels

Data embodied in table 4 reveals the effect of gibberellic acid and BA on number of cormels with different concentrations among different varieties.

Maximum number of cormels were obtained in variety Punjab Glance (2.91) followed by CPG (2.33) and Sylvia (1.96). In growth regulator treatment BA 125 ppm resulted in maximum number of cormels (3.34). Among varieties CPG, resulted in maximum number of cormels per corm with BA 125 ppm (3.30) followed by variety Punjab Glance, maximum number of cormels per corm were observed with BA 125 ppm (5.15). The higher concentration of BA enhance multiple shooting and accelerating corm production in gladiolus. The results are in conformity with the work of Rajaram *et al.* (2002) and Khan *et al.* (2012).

#### Diameter of cormel

The data pertaining to diameter of cormel of gladiolus varieties

with different concentrations of gibberellic acid and benzyladenine is presented in table 4.

Maximum diameter of cormel was observed in Punjab Glance (2.19 cm) followed by CPG (1.97 cm) and Sylvia (1.79 cm), maximum diameter of cormel was observed with gibberellic acid 200 ppm (2.06 cm). Among varieties CPG, presented maximum diameter of cormel with gibberellic acid 200 ppm (2.10 cm) followed by variety Punjab Glance, maximum diameter of cormel was observed at BA 125 ppm (2.44 cm). These results also similar with the findings of Bhalla and Kumar (2008) and Jhon *et al.* (1997).

#### Cormel weight

Table 4 data presents the cormel weight of different varieties of gladiolus with different concentrations of gibberellic acid and benzyladenine.

Maximum cormel weight was observed in variety Punjab Glance (10.10 g) followed by CPG (8.75 g) and Sylvia (6.25 g). The minimum cormel weight was observed in Novalux (2.81) and Gibberellic acid 200 ppm resulted in maximum cormel weight (8.87 g) followed by BA 125 ppm (8.37 g) and these treatments were equally effective. Among varieties CPG, it was observed that gibberellic acid 200 ppm and BA 125 ppm resulted in equivalent results with respect to cormel weight (9.99 g). This might be due to better accumulation of food reserves in the cormels due to increased leaf number, plant height and also leaf size. These vegetative growth parameters resulted in better photosynthesis. These results are also in line with the findings of Sharma *et al.* (2004) in gladiolus.

#### REFERENCES

- Bhalla, R and Kumar, A. 2008.** Response of plant bio-regulators on dormancy breaking in gladiolus. *J Orn Hort.* **11(1)**: 1-8.
- Jhon, A. Q., Paul, T. M and Siddique, M. A. A.1997.** Nutritional studies in gladiolus. Growth and floral characters. *Pl Sci.* **10**: 45-49.
- Khan, F. N., Rahman, M. M and Hossian, M. M. 2012.** Effect of benzyladenine and gibberellic acid on dormancy breaking, growth and yield of gladiolus corms over different storage periods. *J Orn Hort.* **3**: 59-71.
- Neetu and Kumar, R. 2016.** Effect of GA3 on growth, flowering and corm production of gladiolus cultivars. *The Bioscan.* **11(4)**: 2219-2222
- Olszewski, N., Sun, T. P and Gubler, F. 2002.** Gibberellin signaling: Biosynthesis, catabolism and response pathways. *Pl Cell.* **14**: 61-80.
- Padmalathaa, T., Satyanarayana, R. G., Chandrasekhar, R., Sivashankar, A 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. *Int J Pl Anim Envir Sci.* **3**: 28-33.
- Rajaram, Mukherjee, D and Manuja, S. 2002.** Plant growth regulators affect the development of both corms and cormels in gladiolus. *Hort Sci.* **37**: 343-44.
- Sharma, J. R., Gupta, R. B and Panwar, R. D. 2004.** Growth, flowering and corm production of gladiolus cv. Friendship as influenced by foliar application of nutrients and growth regulators. *J Orn Hort.* **7**: 154-58.
- Sajjad, Y., Muhammad, J.J., Muhammad, Q., Mehmood, A., Ahmad, N and Akthar, G. 2015.** Pre- plant soaking of corms in growth regulators influences the multiple sprouting, floral and corm associated traits in Gladiolus Grandiflorus L. *J of Agril Sci.* **7(9)**: 173-181.
- Thakur, T and Dhatt, K. K. 2014.** Genotype × Environment interaction of corm and cormel production of gladiolus. *The Bioscan.* **9(4)**: 1821-1826.
- Uddin, A. F. M. J., Naznin, A., Mahasen, M., Mehraj, H and Sultana, M. N. 2013.** Regulation of growth and flowering of gladiolus with different gibberellic acid concentrations for summer cultivation. *Int J Sustain Agril Tech.* **9**: 116-19.
- Nuvalé, M. U., Aklade, S.A., Desai, J.R and Nannvare, P. V. 20 10.** Influence of plant growth regulators on growth, flowering and yield of chrysanthemum cv. 'IIHR-6. *Int J Pharma Bio Sci.* **1**:1-4.
- Steel, R.G.D., Torrie, J. H. and Dicky, D. A. J 1997.** Principles and procedures of statistics. A biological approach, McGraw Hill Book Co., New York.