

A Research Study of Phytohormones on Vegetative Growth and Flowering Behavior in Gladiolus (*Gladiolus Grandiflorus*)

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ABSTRACT: A study was carried out to investigate the effect of plant growth regulators on growth and flowering of *Gladiolus* varieties Archana (V₁), Friendship (V₂), Mukta (V₃), White Goddess (V₄), Decise (V₅), Green Wood Paeker (V₆), American Beauty (V₇), Bright Eye (V₈), and Tropic Seas (V₉). Phytohormones are chemical messengers produced in one part of plant and translocated to the other parts, where they play critical roles in regulating plant responses to stress at extremely low concentration. Phytohormones are natural products and they called plant growth regulators, when they are synthesized chemically.

KEYWORDS: Growth, Flowering, Growth Regulators, *Gladiolus*

I. INTRODUCTION

Gladiolus (from Latin, the diminutive of *gladius*, a sword) is a genus of perennial cormous flowering plants in the iris family (Iridaceae). It is sometimes called the 'Sword lily', but usually by its generic name (plural *gladioli*). The genus occurs in Asia, Mediterranean Europe, South Africa, and tropical Africa. The center of diversity is in the Cape Floristic Region. The genera *Acidanthera*, *Anomalesia*, *Homoglossum*, and *Oenostachys*, formerly considered distinct, are now included in *Gladiolus*. *Gladiolus* (*Gladiolus grandiflorus*) belongs to family Iridaceae. It is grown primarily for cut



flowers and to a limited extent for landscaping and exhibition purposes. Production of quality flowers as well as plants depends on vigorous pre flowering vegetative growth. Pre flowering growth depends on the amount and availability of macro- and micronutrients in the soil. Potassium is one of the most important macronutrients that affect growth of *gladiolus*.

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Gladiolus is one of the important floriculture crops, grown for its magnificent spikes, useful both as cut flowers and for garden display. Gladiolus is an ornamental bulbous plant, occupies a prime position in floriculture industry and is largely grown for beautifying gardens and homes. Use of growth bio-regulators in Horticulture has brought a great revolution in floriculture industry. Importance of bio-regulators in the field of floriculture is well recognized and outstanding. Growth and flowering regulating bio-regulators were reported to be very effective in manipulating growth behavior and flowering in gladiolus. Among the growth regulators, gibberellins have a special position and are well known for stimulating growth of various plant species including gladiolus.

II. MATERIALS AND METHODS

Present experiment was laid out to study the effect of bio-regulators on growth and flowering behaviour in gladiolus with three replications in Randomized Block Design during 1998-99 at C.S.A. University of Agriculture and Technology, Kanpur. Uniform carms of Archana (V₁), Friendship (V₂), Mukta (V₃), White Goddess (V₄), Decise (V₅), Green Wood Paeker (V₆), American Beauty (V₇), Bright Eye (V₈), and Tropic Seas (V₉) varieties were sown after treating them with gibberellic acid (GA₃) at 00, 250 and 500 ppm. Data on vegetative and reproductive parameters were recorded and presented in different tables for deriving the results.

III. RESULTS AND DISCUSSION

The GA₃ application at different stages not only effected on plant growth and development but also effected on nutrient concentration. The results showed that GA₃ application at different growth stages tended to reduce the N, P and K concentrations in aboveground part organs. It has been reported that the application of GA reduced the uptake of nitrogen and phosphorus relative to the cations, and this is a common response in pea (Garcia and Guardiola, 1981). Therefore, when GA₃ solution was supplied at different stage, the effect of GA₃ on cell elongation and cell expansion might be more effective than the other treatment, as a result the GA₃ application at T₅ reduced the uptake of nutrients. It was found that height of plant as influenced by GA treatment indicated encouraging results (Table-1, 2).

Table-1: Response GA treatments vegetative growth parameters.
(a) Effect of Plant height(cm)

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	40.266	50.333	40.333	43.644
V ₂	42.365	44.066	44.800	43.944
V ₃	36.466	42.800	42.266	40.511
V ₄	42.933	51.466	49.800	48.066
V ₅	46.600	54.533	48.000	49.711
V ₆	45.000	53.466	50.400	49.633
V ₇	48.000	47.600	50.000	48.200
V ₈	34.666	40.233	89.800	38.266
V ₉	36.866	42.066	40.266	30.733
SE	2.545	1.469	4.407	
C.D. at 5%	5.105	2.915	N.S.	

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(b) Effect on number of leaves/plant

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	7.333	8.666	7.666	7.888
V ₂	11.000	11.333	10.000	10.777
V ₃	8.000	10.000	9.000	9.000
V ₄	8.666	10.666	10.000	9.777
V ₅	8.666	10.000	9.000	9.222
V ₆	9.666	10.666	10.333	10.111
V ₇	8.333	9.333	9.333	9.000
V ₈	8.000	8.000	8.333	8.111
V ₉	8.333	9.000	8.666	8.666
SE	0.432	0.249	0.748	
C.D. at 5%	0.866	0.5003	1.501	

(c) Effect of Length of leaf (cm)

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	37.733	39.900	40.833	39.488
V ₂	40.166	45.300	47.500	44.392
V ₃	38.766	46.666	44.033	43.155
V ₄	40.333	45.500	44.300	43.377
V ₅	38.333	44.366	47.000	43.233
V ₆	38.766	42.633	39.566	40.122
V ₇	29.400	36.466	34.700	33.522
V ₈	28.333	37.700	34.333	33.455
V ₉	34.600	35.600	37.133	35.777
SE	2.545	1.469	4.409	
C.D. at 5%	5.106	2.948	N.S.	

(d) Effect on Width of leaf (cm)

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	2.733	2.833	2.933	2.833
V ₂	3.233	3.700	3.533	3.488
V ₃	3.933	4.066	4.100	4.033
V ₄	3.400	3.633	3.766	4.033
V ₅	3.373	4.833	4.233	3.600
V ₆	3.066	3.066	3.066	4.133
V ₇	2.700	2.833	3.133	2.988
V ₈	2.600	2.666	3.066	2.888
V ₉	3.266	3.733	3.966	2.777
SE	0.250	0.144	0.434	
C.D. at 5%	0.503	0.290	N.S.	

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**Table 2 :Response of GA treatments to reproductive growth and spike parameters.
(a) Effect on spike emergence (days)**

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	72.000	69.000	69.666	70.222
V ₂	75.333	72.666	74.666	74.222
V ₃	92.333	78.666	73.333	31.444
V ₄	85.333	68.666	70.333	74.777
V ₅	70.333	68.000	70.000	69.444
V ₆	68.666	60.666	66.666	67.333
V ₇	61.666	60.666	60.333	60.777
V ₈	70.000	66.000	68.000	68.000
V ₉	63.000	62.333	68.000	62.777
SE	1.940	1.20	3.361	
C.D. at 5%	3.893	2.248	6.743	

(b) Effect on length of spike (cm)

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	32.233	37.233	36.200	35.222
V ₂	27.433	33.533	39.739	33.566
V ₃	34.466	35.133	35.300	34.966
V ₄	38.433	38.533	37.166	38.044
V ₅	31.533	45.233	45.400	40.722
V ₆	49.833	49.039	46.100	48.322
V ₇	48.000	47.833	48.733	48.188
V ₈	32.733	32.366	31.100	32.666
V ₉	32.600	50.233	51.200	44.677
SE	3.512	2.028	6.089	
C.D. at 5%	7.045	4.067	N.S.	

(c) Effect on Diameter spike (cm)

Treatments / Variety	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)
V ₁	0.000	0.833	0.844
V ₂	0.900	0.866	0.922
V ₃	0.866	0.833	0.844
V ₄	0.900	0.966	0.933
V ₅	0.900	1.000	0.944
V ₆	0.899	0.866	0.844
V ₇	0.733	0.733	0.766
V ₈	0.733	0.700	0.688
V ₉	0.833	0.833	0.822
SE	0.0305	0.0176	0.0529
C.D. at 5%	0.0612	N.S.	N.S.

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(d) Effect on length of flower (cm)

Treatments / Variety	Concentration of GA ₃			
	0.0 ppm (G ₀)	250 ppm (G ₁)	500 ppm (G ₂)	Average
V ₁	5.566	6.200	6.300	6.022
V ₂	4.800	5.466	5.333	5.200
V ₃	5.733	5.833	6.100	5.888
V ₄	5.700	6.066	5.866	5.877
V ₅	5.466	6.233	6.000	5.900
V ₆	5.600	5.966	5.333	5.633
V ₇	6.966	7.366	6.933	7.088
V ₈	5.100	5.500	5.566	5.388
V ₉	4.900	6.500	5.900	5.766
SE	0.282	0.163	0.239	
C.D. at 5%	0.566	0.326	N.S.	

It is evident from the data that variety (V₅) revealed that maximum plant height (49.711 cm) GA treatments induced significantly superior plant height in gladiolus at all the stages in comparison to control. GA treatments also produced significantly more number of leaves in the same treatment. Foliar application of GA at 500 ppm also increased the number of leaves significantly superior to control. Treatment of 250 ppm produced large number of leaves per plant as compared to 500 ppm and control treatments. Similar results have been found by Bhattacharjee (1983, 1984), Jana and Biswas (1982), Chaudhary (1987) and Singh *et al.* (1995).

It is obvious from the table-1 that the maximum length of leaves was recorded with variety 2 which was significantly greater than control. Plants under Bright Eye showed significant minimum leaf length followed by American Beauty and Tropic Seas. Treatment of 500 ppm increased significantly leaf length (47.500) in variety V₂. However, variety V₅ showed the maximum width of leaf (4.133) but treatment 250 ppm maximum width (4.833 cm) where as it was minimum 2.777 cm in variety (V₈). Present findings are in accordance with the results reported by Pathak *et al.* (1980) and Sujata (1983).

The number of days required for spike emergence in gladiolus were found to be influenced with GA treatments which varied significantly. Minimum period requirement has shown positive results. The higher treatment of GA at 500 ppm produced early spikes which took significantly lesser period for spike emergence in comparison to control. Length of spike was also found affected by GA treatment at higher concentration. Foliar application of GA at 500 and 250 ppm increased length of spike significantly as compared to control. GA at 500 ppm produced the maximum length of spike 51.200 cm in V₉ variety. Similar findings have also been observed by Mathur and Sharma (1969), Jana *et al.* (1979), Biswas *et al.* (1983) and Kumar *et al.* (1998).

It is apparent that diameter of spike length of floret in treatments 250 and 500 ppm were found the maximum in variety V₅ and V₂. The maximum length of floret was found 7.366 and 6.933 cm in V₇ in 250 ppm and 500 ppm treatments, respectively. Interaction between varieties and GA treatments proved improving in respect of length of the flowers. Singh *et al.* (1995) also confirmed the present findings in gladiolus.

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