

Original Research Article

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Effect of Benzyl Adenine and Gibberellic Acid on Flowering and Flower Quality Attributes of Gladiolus

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ABSTRACT

An experiment was conducted to study the effect of benzyl adenine and gibberellic acid on flowering and flower quality attributes of gladiolus (*Gladiolus hybridus* L.) cv. summer sunshine in Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere (Under University of Agricultural and Horticultural Sciences, Shivamogga) during 2017-18. The experiment was consisted with sixteen different treatments viz., BA (100, 200 and 300 ppm), GA₃ (150, 200 and 250 ppm) and their combinations along with the control. Each treatment was replicated thrice in Randomized Complete Block Design (RCBD). The results revealed that GA₃ at 150 ppm recorded minimum days taken for spike initiation (66.27), first floret opening (73.73 days), 50 per cent flowering (77.87 days), maximum spike girth (12.37 mm), spike weight (98.03 g), floret length (10.73 cm) and floret diameter (10.33 cm). However, GA₃ at 250 ppm recorded maximum duration of flowering (24.40 days), spike length (94.07 cm), rachis length (60.70 cm), florets per spike (18.80) and vase life (15.00 days). Whereas, BA at 300 ppm exhibited the maximum number of days for spike initiation (85.83), first floret opening (91.40 days), 50 per cent flowering (96.17 days) and maximum spike yield per plant (3.30).

Keywords

Gladiolus, BA, GA₃
and flowering
parameters

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Introduction

Flowers are intricately entwined in the social fabric of our country and no function is complete without flowers. With changing life styles and increased urban affluence, flower growing has assumed a definite commercial status in recent times. A popular flower gladiolus (*Gladiolus hybridus* L.) is native to South Africa and belongs to the family Iridaceae. Gladiolus is commonly called as

‘Sword lily’ since the leaves of gladiolus resemble the sword and it is popularly known as Queen of the bulbous flowers due to its attractive shades, varying sizes of flowers, brilliant colour tones and long lasting vase life. It is mainly cultivated for the production of cut flowers, bouquet preparation and for bedding purpose in landscape. Growth regulating chemicals are applied when a desirable effect cannot be achieved by manipulation of the plant environment.

Synthetic growth regulating chemicals are becoming extremely important and valuable in the floriculture for manipulating the growth and flowering of many commercial flower crops and ornamental plants. Gibberellins play an important role in the physiological processes of plant life cycle like stem elongation, germination, breaking dormancy, sex expression, enzyme induction, leaf senescence, flowering and quality of the produce (Mishra *et al.*, 2018). While, benzyl adenine has been reported to stimulate the growth of axillary buds in plants as reported by Sajjad *et al.*, (2015). Since BA and GA₃ applications at very low concentrations can have a profound effect while too much have detrimental effect. The present investigation was undertaken on effect of BA and GA₃ on flowering and flower quality attributes of gladiolus cv. Summer Sunshine.

Materials and Methods

The experiment was carried out at the Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere (Under University of Agricultural and Horticultural Sciences, Shivamogga) during 2017-18. The experiment was laid out in Randomized Complete Block Design with 16 treatments and 3 replications, in which pre plant corms of medium sized were soaked for 24 hrs in different growth regulators *viz.*, BA (100, 200 and 300 ppm), GA₃ (150, 200 and 250 ppm) and their combinations along with the control. The soaked corms were dried under shade for 2 hrs and then planted immediately at 30 × 20 cm spacing in flat bed. The crop was fertilized with 100: 60: 60 Kg/ha of NPK (Anon., 2013). The intercultural operations like weeding, irrigation and earthing up were done as and when necessary. The observations were recorded during peak flowering stage and were statistically analyzed.

Results and Discussion

Plant growth regulators like benzyl adenine and gibberellic acid had shown the significant difference with respect to number of days taken for spike initiation, first floret opening, 50 per cent flowering and duration of flowering in gladiolus.

The results of the present investigation revealed that plants treated with GA₃ at 150 ppm exhibited minimum days taken for spike initiation (66.27), first floret opening (73.73 days) and 50 per cent flowering (77.87 days) and it was statistically on par with the other concentrations of GA₃ at 200 ppm (68.13, 75.83 and 78.93 days, respectively) and GA₃ at 250 ppm (69.47, 77.10 and 79.47 days, respectively). The maximum days taken for spike initiation (85.83), first floret opening (91.40 days) and 50 per cent flowering (96.17 days) was noticed in BA at 300 ppm (Table 1). It might be due to early emergence of corms, meanwhile early completion of vegetative phase by rapid cell division and cell elongation and GA₃ is quite effective in reducing the juvenile period of plants. Similar trends were found by Ram *et al.*, (2001) in gladiolus. Another promising reason might be enhanced vegetative growth in early phase due to increased photosynthetic activity and CO₂ fixation from GA₃ treated plants. BA at 300 ppm (T₃) took the maximum period of time to reach spike initiation stage, first floret opening and 50 per cent flowering. It might be due to multiple shooting rather than cell elongation. Similar observations were reported by Khan *et al.*, (2011), Aier *et al.*, (2015) and Reshma *et al.*, (2017) in gladiolus.

The duration of flowering was found to be maximum (24.40 days) in plants treated with GA₃ at 250 ppm, it was statistically on par with GA₃ at 200 ppm (22.37 days) and GA₃ at 150 ppm (21.40 days) respectively. The minimum flowering duration (15.00 days) was

observed in control (Fig. 1). GA₃ increases the photosynthetic and metabolic activities causing more transportation and utilization of photosynthetic products, which might have helped the spikes to last longer on plant in the field. These results are in conformity with Baskaran and Misra (2007), Aier *et al.*, (2015) and Chopde *et al.*, (2015) in gladiolus.

Corms treatment with BA at 300 ppm recorded maximum number of spikes yield per plant (3.30), it was statistically on par with BA at 200 ppm (2.87) whereas minimum spike yield (1.00) was recorded in control (Table 1). BA increased the spikes yield, it might be due to the maximum number of shoots per corm (Aier *et al.*, 2015). Variation of spikes yield among the treatments was might be due to

significant difference in per cent sprouting of corms, number of spikes per plant which is a controlled by genotypic factor along with effect of growth regulators. Similar views are expressed by Kumar and Singh (2005), Chopde *et al.*, (2013) and Manasa *et al.*, (2017) in gladiolus.

It is evident from the table 2, that significant differences were noticed among different concentrations with respect to spike length and rachis length. The maximum spike length (94.07 cm) and rachis length (60.70 cm) was recorded with GA₃ at 250 ppm (T₆) which was significantly superior over other treatments and it was statistically on par with GA₃ at 200 ppm (93.13 cm and 58.23 cm) and GA₃ at 150 ppm (90.33 cm and 55.39 cm).

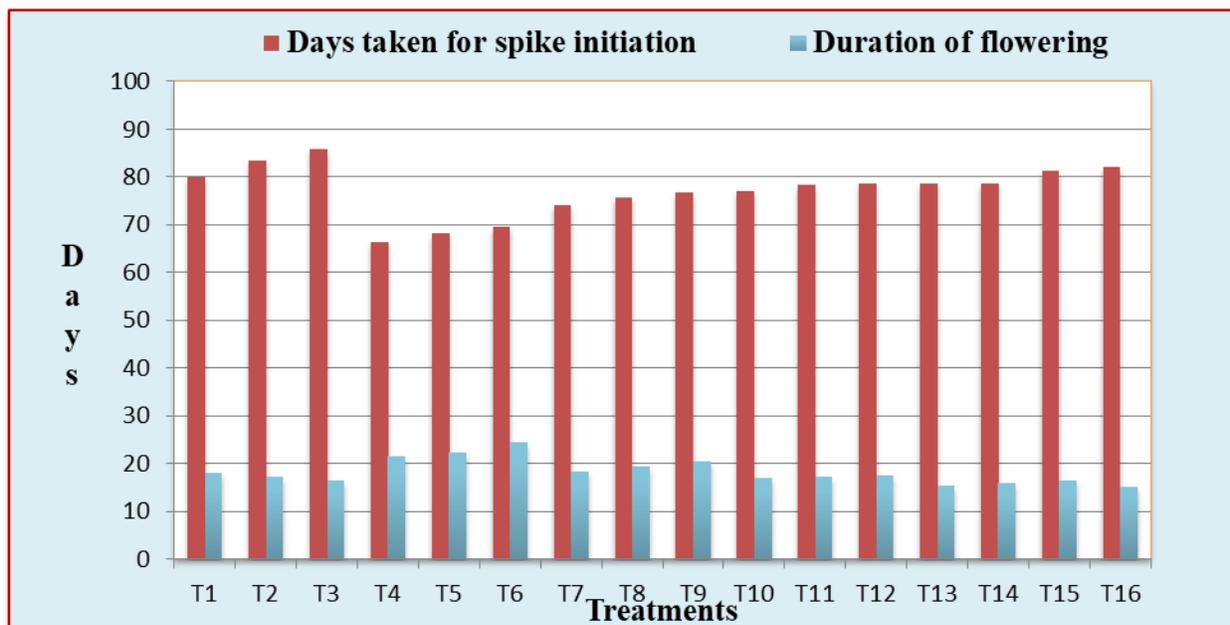
Table.1 Effect of benzyl adenine and gibberellic acid on flowering and flower yield in gladiolus cv. Summer Sunshine

Treatment details	Days taken for initiation of inflorescence	Days taken for first floret opening	Days taken for 50 per cent flowering	Duration of flowering (days)	Spike yield per plant (Nos.)
T₁- BA @ 100 ppm	80.07	86.92	91.47	18.10	2.47
T₂- BA @ 200 ppm	83.37	89.33	94.10	17.10	2.87
T₃- BA @ 300 ppm	85.83	91.40	96.17	16.30	3.30
T₄- GA₃ @ 150 ppm	66.27	73.73	77.87	21.40	1.03
T₅- GA₃ @ 200 ppm	68.13	75.83	78.93	22.37	1.07
T₆- GA₃ @ 250 ppm	69.47	77.10	79.47	24.40	1.10
T₇- BA @ 100 ppm + GA₃ @ 150 ppm	74.07	81.60	85.03	18.33	1.33
T₈- BA @ 100 ppm + GA₃ @ 200 ppm	75.73	82.22	85.67	19.33	1.40
T₉- BA @ 100 ppm + GA₃ @ 250 ppm	76.65	82.64	86.10	20.33	1.50
T₁₀- BA @ 200 ppm + GA₃ @ 150 ppm	77.17	84.00	87.43	17.00	1.73
T₁₁- BA @ 200 ppm + GA₃ @ 200 ppm	78.27	84.83	88.07	17.10	1.77
T₁₂- BA @ 200 ppm + GA₃ @ 250 ppm	78.53	84.98	88.40	17.50	2.03
T₁₃- BA @ 300 ppm + GA₃ @ 150 ppm	78.60	85.17	88.60	15.33	2.27
T₁₄- BA @ 300 ppm + GA₃ @ 200 ppm	78.65	85.73	89.17	16.00	2.40
T₁₅- BA @ 300 ppm + GA₃ @ 250 ppm	81.27	87.33	92.40	16.50	2.50
T₁₆- Control	82.17	90.23	93.07	15.00	1.00
S. Em ±	2.59	2.82	2.53	1.24	0.19
C D @ 5%	7.49	8.13	7.32	3.58	0.55

Table.2 Effect of benzyl adenine and gibberellic acid on flower quality parameters in gladiolus cv. Summer Sunshine

Treatment details	Spike length (cm)	Rachis length (cm)	Spike girth (mm)	Spike weight (g)	Floret length (cm)	Floret diameter (cm)	Number of florets per spike	Vase life
T₁- BA @ 100 ppm	80.90	41.17	10.03	78.30	8.73	8.48	14.17	9.70
T₂- BA @ 200 ppm	79.80	38.83	9.53	75.60	8.59	8.20	14.03	9.60
T₃- BA @ 300 ppm	74.90	35.50	9.47	73.80	8.53	8.17	14.00	9.33
T₄-GA₃ @ 150 ppm	90.33	55.39	12.37	98.03	10.73	10.33	18.03	13.00
T₅- GA₃ @ 200 ppm	93.13	58.23	12.07	96.23	10.43	10.07	18.47	14.00
T₆- GA₃ @ 250 ppm	94.07	60.70	11.79	95.43	9.75	9.14	18.80	15.00
T₇- BA @ 100 ppm + GA₃ @ 150 ppm	84.47	49.47	11.61	93.30	9.97	9.09	16.07	10.00
T₈- BA @ 100 ppm + GA₃ @ 200 ppm	85.67	50.73	11.33	89.53	9.46	9.06	16.80	11.00
T₉- BA @ 100 ppm + GA₃ @ 250 ppm	87.90	53.72	10.85	89.50	9.27	8.95	17.13	12.00
T₁₀- BA @ 200 ppm + GA₃ @ 150 ppm	82.57	46.73	10.81	87.93	9.25	8.93	15.35	8.00
T₁₁- BA @ 200 ppm + GA₃ @ 200 ppm	83.13	47.53	10.80	86.93	9.17	8.79	15.93	8.27
T₁₂- BA @ 200 ppm + GA₃ @ 250 ppm	84.07	49.27	10.71	86.53	8.90	8.77	16.00	8.83
T₁₃- BA @ 300 ppm + GA₃ @ 150 ppm	81.47	43.77	10.67	86.47	8.87	8.70	14.67	7.20
T₁₄- BA @ 300 ppm + GA₃ @ 200 ppm	82.10	45.07	10.54	82.53	8.80	8.58	15.13	7.50
T₁₅- BA @ 300 ppm + GA₃ @ 250 ppm	82.43	45.95	10.25	82.00	8.79	8.57	15.53	7.67
T₁₆- Control	81.33	42.03	10.04	81.87	7.93	7.77	14.50	7.00
S. Em ±	3.34	2.57	0.33	3.28	0.31	0.28	1.01	0.45
C D @ 5%	9.66	7.43	0.96	9.46	0.90	0.80	2.92	1.30

Fig.1 Effect of benzyl adenine and gibberellic acid on days taken for spike initiation and duration of flowering in gladiolus cv. Summer Sunshine



The increased spike length with GA₃ treatment might be due to rapid inter nodal elongation as a results of rapid cell division and cell elongation in the intercalary meristem. Similar results were recorded by Chopde *et al.*, (2013) and Padmalatha *et al.*, (2013) in gladiolus. However, the minimum spike length (74.90 cm) and rachis length (35.50 cm) was obtained in treatment BA at 300 ppm. The BA might have enhanced source to sink ratio to corms and cormels production by reducing the partition of carbohydrates to the spike. These results are in accordance with findings of Tawar *et al.*, (2007) and Manasa *et al.*, (2017) in gladiolus.

The spike girth and spike weight showed significant differences among the different treatments (Table 2). The maximum spike girth (12.37 mm) and spike weight (98.03 g) was observed in the plants treated with GA₃ at 150 ppm, it is on par with GA₃ at 200 ppm and GA₃ at 250 ppm respectively. The minimum spike girth (9.47 mm) and spike weight (73.80 g) was obtained in treatment

BA at 300 ppm. Maximum spike girth and spike weight from GA₃ treated plants might be due to increased carbon assimilation and increased activity of growth promoting enzymes by synthesizing more nucleic acid and carbohydrates. These observations are in conformity with results which are reported earlier by Maurya and Nagada (2002) and Manasa *et al.*, (2017) in gladiolus.

In the present study, the maximum length of the florets (10.73 cm) and floret diameter (10.33 cm) was recorded with GA₃ at 150 ppm while, the minimum length of the florets (7.93 cm) and floret diameter (7.77 cm) was recorded in control. These results are in conformity with earlier reports by Padaganur *et al.*, (2005) and Nilima *et al.*, (2014) in tuberose. It might be due to GA₃ which promotes cell division and cell elongation and it increases the activity of enzymes which are involved in cell elongation process.

In the present study, the maximum number of florets per spike (18.80) was found with the

treatment GA₃ at 250 ppm, it was statistically on par with GA₃ at 200 ppm (18.47) and GA₃ at 150 ppm (18.03). The minimum number of florets per spike (14.00) was observed in the treatment BA at 300 ppm. It might be due to availability of optimum quantity of GA₃, which encourages to increased spike length and rachis length, which are positively correlated to the number of floret per spike. GA₃ promotes the growth of auxiliary buds and their flowering. These findings in the present investigation are in accordance with earlier reports by Sarkar *et al.*, (2009) in tuberose.

GA₃ treated plants showed significantly maximum vase life (15.00 days), whereas, minimum was recorded by control (7.00 days), which might be due to longer spike length and more number of florets per spike which opens in a fashion of acropetal at the rate of one floret in 1-2 days intervals. Similar results were reported by Nelofar *et al.*, (2005) and Patil and Jadhav (2010) in tuberose (Table 2).

In conclusion, GA₃ at 150 ppm recorded best results with respect to flowering and flower quality parameters like spike girth, spike weight, floret length and floret diameter. Whereas, BA at 300 ppm exhibited the maximum spike yield per plant. GA₃ at 250 ppm recorded maximum duration of flowering and flower quality parameters like spike length, rachis length, florets per spike and vase life.

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