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Effect of GA_3 on growth and flowering attributes of gladiolus cultivars

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Abstract

An experiment was conducted at Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, to study the effect of GA_3 on growth and flowering attributes in gladiolus cultivars. Treatments consisted of GA_3 at 100 ppm, 200 ppm, 300 ppm and 400 ppm alongwith control on 5 cultivars of gladiolus *viz*., Archana, Gunjan, J.V. Gold, Sabnum and Snow Princes. Experiment was laid-out in a Randomized Block Design and with three replications. The results revealed that maximum length of leaf and width of longest leaf were recorded when GA_3 was sprayed at 400 ppm on cvs. Sabnum and Gunjan. However, maximum number of leaves/plant was registered with cv. Gunjan at 200 ppm GA_3. Among flowering parameters early spike emergence was noticed in cv. Sabnum when, GA_3 was sprayed at higher concentrations (300-400 ppm). In general, higher size of first and fifth floret was recorded with cv. J.V. Gold at 200-300 ppm GA_3. GA_3 at 300 ppm also exerted maximum length of spike, whereas maximum number of florets/spike was recorded with cv. Snow Princess when GA_3 was applied at 100-200 ppm.

Key words: Gladiolus, GA_3, growth, flowering, cultivar.

Gladiolus is very popular and important ornamental flowering plant. It is known as queen of bulbous flowers. It belongs to the family iridaceae and is a native of Mediterranean region. It is excellent for cut flowers as it lasts long in flower vase and has magnificent florets with variety of colours (Singh, 2006). Selections suitable variety for the region is one of the important factors that influence the yield and quality of gladiolus spikes. The growth and development of plant is governed by internal factors namely hormonal and nutritional balance. The balanced development of plant is governed by the growth regulators, which are being increasingly used to manipulate the growth and flowering of ornamental plants. Beneficial effect of growth promoting chemical have been observed in flowering plants i.e. tuberose and calendula (Singh, 1999). Therefore, the present study was undertaken to find out the influence of gibberellic acid on growth and flowering of various cultivars of gladiolus flower.

Materials and Methods

A field experiment was carried out at Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, India during the year of 2008-09. Varanasi is situated in the sub-tropical zone at a latitude of 28°18' N and longitude of 83°03' E. The altitude of the place is 128.93 meters above the mean sea level. The climate of the place is semi-arid and characterized by three distinct seasons *viz*. hot and dry summer from February to May, warm rainy monsoon from June to September and moderate winter from October to January. The mean annual precipitation on the basis of last

fifteen years is 1000 mm which is received almost from the South-West monsoon during June to October. The mean annual minimum and maximum temperatures are 16.9 °C and 34.8 °C, respectively. The humidity ranges from 29.75 per cent in summer to 91.23 per cent in rainy season. The experiment was laid out in randomized block design with three replications and twenty five treatment combinations. The factor comprised of GA_3 at 100, 200, 300, 400 ppm alongwith control (Distilled water) on five gladiolus varieties *viz*. Archana, Gunjan, J.V. Gold, Sabnum and Snow Princes. Thus there were twenty five treatment combinations. The rested, cold stored, uniform and bigger size gladiolus corms of five varieties were selected and placed at room temperature for 15 days and treated with 0.3% captan fungicide for 15 minutes before planting. After drying in shade, the corms were planted at 20 cm spacing. Solution of plant growth regulator was sprayed at different concentrations to run-off stage at 30th and 60th day after planting. Control plants were sprayed with distilled water in the same manner and all the intercultural operations were followed as and when required. The various observations on growth and flowering attributes were recorded and the data was statistically analyzed.

Results and Discussion

Application of plant growth regulators resulted in pronounced effect on growth characteristics in gladiolus (Table 1). Early sprouting was recorded when GA_3 was sprayed @ 300 ppm followed by 400 ppm. It was observed that GA_3 induced early and vigorous sprouting. This finding has been substantiated by Ogale *et al*. (2000). GA_3 was the most effective for early sprouting (11.02 days). Among the varieties the corms of cv. Archana sprouted early. GA_3 treatment was found to be highly effective and significantly increased the sprouting percentage of cultivars. Treatment with GA_3 @ 200 ppm produced maximum sprouting percentage in all the cultivars. Treatment with GA_3 @ 200 ppm resulted in maximum sprouting percentage followed by GA_3 @ 100 ppm in cv. Archana. The observations were found statistically superior to other varieties. Earlier work was carried out by Kumar *et al*, (2002) is in line with the present observations. The length of longest leaf was increased significantly due to GA_3 treatment. Application of GA_3 @400 ppm resulted in maximum length of longest leaf in cultivar cv. Sabnam. These results are in agreement with the observations made by Singh and Sharma (2004) in calendula. The present findings also lent credence to the observations of Tyagi and Singh (2008) in tuberose. Width of longest leaf significantly increased due to GA_3 treatment. Maximum width of longest leaf was observed at GA_3 @ 400 ppm, which was statistically at par with GA_3 @ 100 ppm. Among cultivars cv. Gunjan produced maximum width of longest leaf. The number of leaves/plant was significantly increased due to GA_3 treatment. Among varieties, cv. J.V. Gold produced maximum leaves/plant. Application of GA_3 @ 200 ppm resulted in highest number of leaves/plant followed by GA_3 spraying @ 100 ppm. This finding is in agreement with the observations made by Singh (1999). Panwar *et al*, (2006) in tuberose.

Foliar application of various concen-trations of GA_3 exerted conspicuous effect on different cultivars of gladiolus (Table 2). GA_3 @ 400 ppm had pronounced effect on early spike emergence in cv. Sabnum followed by 100 ppm GA_3 in cv. Sabnum, but this treatment was statistically superior to all the treatments. In general, late spike emergence was observed in control plants. Devadanam *et al.* (2007), Panwar *et al.* (2006) also noticed that GA_3 was found best for early initiation of spike. Application of GA_3 @ 300 ppm produced earliest flowering in cv. Sabnum which was statistically at par with the higher concentration of GA_3 i.e. 400 ppm in same cultivar (i.e. Sabnum). Present findings also lent credence to the observation of Jana and Biswas (2003). Similar report was also reported by Chang *et al*. (1999) and Singh (1999) in tuberose. Length of spike significantly increased at GA_3 @ 300 ppm treatment with cv. J.V. Gold which was statistically at par with GA_3 200 ppm in cv. J.V. Gold whereas minimum spike length was recorded when GA_3 was sprayed @ 400 ppm in cv. Gunjan. The earlier work carried out by Singh and Sharma (2004) are also in congruence with these findings. GA_3 treatment produced striking

Table 1. Effect of fertility levels and biofertilizers on yield attributes, yield and net returns of gladiolus

Treatment	Days to sprouting	Sprouting of cultivars (%)	Number of sprouts/plant	Length of longest leaf (cm)	Width of longest leaf (cm)	No. of leaves/plant
Control Archana	17.00	48.22	0.66	53.03	2.14	6.21
Control Gunjan	12.40	88.97	2.17	63.33	2.54	14.00
Control J.V. Gold	12.07	66.13	1.55	60.68	2.55	7.50
Control Sabnum	15.31	77.55	1.00	49.51	2.09	4.89
Control Snow Princess	15.07	66.13	1.66	61.63	2.03	7.13
GA_3 100 ppm Archana	12.49	77.55	1.89	54.38	2.26	11.55
GA_3 100 ppm Gunjan	12.35	88.97	2.33	67.25	2.83	16.16
GA_3 100 ppm J.V. Gold	12.67	88.97	2.33	62.00	2.33	8.44
GA_3 100 ppm Sabnum	14.18	88.97	2.33	76.66	1.99	12.77
GA_3 100 ppm Snow Princess	13.95	77.55	1.44	71.50	2.06	11.26
GA_3 200 ppm Archana	12.07	77.55	2.11	62.16	2.22	11.99
GA_3 200 ppm Gunjan	10.07	88.97	3.17	66.75	2.63	17.16
GA_3 200 ppm J.V. Gold	11.06	88.97	2.88	53.99	2.06	13.77
GA_3 200 ppm Sabnum	14.27	88.97	2.33	67.10	1.83	11.32
GA_3 200 ppm Snow Princess	12.41	66.13	1.44	68.06	1.80	9.56
GA_3 300 ppm Archana	10.21	66.13	1.33	52.77	1.31	11.55
GA_3 300 ppm Gunjan	10.75	88.97	2.50	63.66	2.33	15.66
GA_3 300 ppm J.V. Gold	12.31	88.97	3.00	57.45	2.29	12.99
GA_3 300 ppm Sabnum	13.52	88.97	3.00	72.32	1.82	15.10
GA_3 300 ppm Snow Princess	12.58	88.97	1.55	70.86	2.20	13.60
GA_3 400 ppm Archana	11.02	71.06	1.55	53.33	1.51	10.11
GA_3 400 ppm Gunjan	12.86	88.97	2.83	61.16	3.67	15.66
GA_3 400 ppm J.V. Gold	11.28	88.97	2.89	59.10	1.93	15.33
GA_3 400 ppm Snow Princess	12.49	77.55	1.77	66.66	1.70	9.73
SE(d)	1.64	11.69	0.50	7.49	0.27	2.11
C.D. (P=0.05)	3.31	23.58	1.01	15.11	0.55	4.26

Table 2. Effect of fertility levels and biofertilizers on quality parameters and net returns of gladiolus

Treatment	Days to spike emergence	Days to colour show	Length of spike (cm)	No. of florets/spike	Diameter of first floret (cm)	Diameter of fifth floret (cm)	Duration of flowering
Control Archana	72.88	82.21	82.57	8.00	10.96	10.97	12.36
Control Gunjan	74.50	80.50	59.77	9.00	9.10	9.35	13.90
Control J.V. Gold	74.44	83.33	93.83	10.33	11.24	11.79	14.10
Control Sabnum	72.38	80.55	97.62	11.33	8.92	8.83	15.66
Control Snow Princess	72.99	82.33	93.34	11.00	9.64	10.08	13.56
GA_3 100 ppm Archana	72.88	83.66	77.74	7.33	10.86	9.16	11.23
GA_3 100 ppm Gunjan	73.16	78.33	61.16	6.67	8.65	10.39	14.66
GA_3 100 ppm J.V. Gold	74.77	82.77	94.26	10.67	12.03	12.18	15.10
GA_3 100 ppm Sabnum	67.63	80.11	97.42	10.33	8.99	9.55	16.52
GA_3 100 ppm Snow Princess	70.77	81.88	93.87	12.67	9.90	10.56	12.93
GA_3 200 ppm Archana	75.88	84.77	81.15	7.67	10.05	12.26	11.20
GA_3 200 ppm Gunjan	73.33	80.33	61.36	7.00	11.03	11.30	14.06
GA_3 200 ppm J.V. Gold	75.66	85.44	100.36	8.33	12.25	12.58	14.10
GA_3 200 ppm Sabnum	68.77	78.88	97.26	8.33	9.28	10.06	14.03
GA_3 200 ppm Snow Princess	71.66	81.77	97.54	13.00	10.46	12.73	13.33
GA_3 300 ppm Archana	81.00	84.77	81.28	6.33	11.12	11.42	11.16
GA_3 300 ppm Gunjan	72.83	78.33	67.40	5.67	9.55	9.56	14.06
GA_3 300 ppm J.V. Gold	75.77	86.10	102.30	7.33	12.93	11.26	14.96
GA_3 300 ppm Sabnum	68.77	79.22	70.53	9.33	8.83	8.80	14.50
GA_3 300 ppm Snow Princess	73.77	84.55	70.55	9.33	9.62	10.58	14.16
GA_3 400 ppm Archana	81.21	87.55	80.88	6.00	8.45	10.14	11.03
GA_3 400 ppm Gunjan	73.83	78.33	57.91	6.67	8.17	8.85	14.90
GA_3 400 ppm J.V. Gold	75.10	87.22	96.10	9.00	10.78	11.38	14.76
GA_3 400 ppm Snow Princess	75.55	86.22	92.5	11.67	9.10	8.63	13.66
SE(d)	1.27	1.16	4.48	1.23	0.76	0.93	0.92
CD (P=0.05)	2.57	2.33	9.04	2.47	1.54	1.88	1.85

effect in enhancing the number of florets/spike. Application of GA_3 @ 200 ppm resulted in maximum number of florets/spike in cv. Snow Princess followed by GA_3 @ 100 ppm in cv. Snow Princess. Earlier work carried out by Tyagi and Singh (2008) in tuberose are also in congruence with these findings. The present study also lent credence with the findings of Prakash and Jha (1998) in gladiolus. Among varieties cv. Sabnum exhibited maximum number of florets. It was observed that number of florets/spike varied greatly due to cultivars (Gond, 1997). Spraying GA_3 at 100 ppm improved duration of flowering in cultivar Sabnam, whereas minimum duration of flowering was recorded with GA_3 @ 300 ppm in cv. Archana. The results are in close conformity with the findings of Sharma *et al.* (2006) who noticed that application of GA_3 at different concentration in general prolonged duration of flowering in gladiolus. Application of GA_3 @ 200 ppm followed by @ 300 ppm significantly increased floret diameter. The results are in close conformity with the findings of Padaganur *et al.* (2005) in tuberose.

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