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EFFECT OF GA_3 ON GROWTH, FLOWERING AND CORM PRODUCTION OF GLADIOLUS CULTIVARS

NEETU[1]*AND RAKESH KUMAR[2]
[1]Department of Horticulture,
Institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221 005
[2]Department of Agronomy, CSIR-CIMAP Research Centre Pantnagar - 263 149
e-mail: nitubhu2009@gmail.com

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***Corresponding author**

ABSTRACT
An experiment was conducted to study the effect of on growth, flowering and corm production of gladiolus cultivars. The study involved four concentration of GA_3 (control, 100 ppm, 200 ppm, 300 ppm and 400 ppm) was sprayed at 30th and 60th day after planting on five cultivars (Archana, Gunjan, J.V. Gold, Sabnum and Snow Princes) of gladiolus. 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, while maximum number of corms $hill^{-1}$(3.67) was noticed with cv. Sabnum when GA_3 was applied at 300-400 ppm. The data from this study indicated that effect of GA_3 on growth, flowering and corm production of gladiolus cultivars.

INTRODUCTION

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 sprouting, growth and flowering of Gladiolus cultivars (Bhujbal *et al.,* 2014). Beneficial effect of growth promoting chemical have been observed in flowering and bulbous plants *i.e.* tuberose and calendula (Singh, 1999). Therefore, the present study was undertaken to find out the influence of gibberellic acid on growth, flowering and corm production 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 16.9ºC and 34.8ºC, 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 and 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 by adopting the standard procedures of Panse and Sukhatme (1985) and the results were interpreted.

RESULTS AND DISCUSSION

Growth characters

Application of plant growth regulators resulted pronounced effect on growth characteristics in gladiolus (Table 1). The length of longest leaf was increased significantly due to GA_3 treatment. Application of GA_3 400 ppm produced maximum length of longest leaf (77.21 cm) in cultivar cv. Sabnam. This finding is in agreement with the observations made by Singh and Sharma (2004) in calendula. The present finding is lent credence to the observation of Tyagi and Singh (2008) in tuberose. Width of longest leaf was significantly increased due to GA_3 treatment. Maximum width of longest leaf was observed at GA_3 400 ppm and in respect to cultivars cv. Gunjan produced maximum width of longest leaf (3.67 cm) in gladiolus. The number of leaves/hill was significantly increased due to GA_3 treatment. Application of GA_3 200 ppm produced highest number of leaves/hill (17.16) in cv. Gunjan. This finding is in agreement with the observations made by Singh (1999). Panwar *et al*. (2006) in tuberose, in respect to varieties, cv. J.V. gold produced maximum leaves/hill.

Flowering attributes

Foliar application of different concentrations of GA_3 exerted conspicuous effect on various cultivars of gladiolus (Table 1&2). GA_3 spray at 400 ppm had pronounced effect on early spike emergence (64.88 days) in cv. Sabnum followed by 100 ppm GA_3 application 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 resulting early initiation of spike. In respect to varieties, variety Sabnum produced earliest bud initiation. Application of GA_3 400 ppm produced earliest flowering. Present findings are lent credence to the observation of Jana and Biswas (2003). Cultivar J.V. Gold showed significant early flowering over cultivars Archana and Snow Princess. Similar report was investigated by Chang *et al*. (1999) and Singh (1999) in tuberose. Early colour showed (78.33 days) was seen in cv. Gunjan when GA_3 spray at 100 ppm, whereas, cv. Sabnum showed colour (78.33 days) when GA_3 spray at 400 ppm. Length of spike was significantly increased by GA_3 treatment and GA_3 300 ppm maximum length of spikes (102.3 cm) observed in cv. J.V. Gold. The earlier work carried out by Singh and Sharma (2004) are also in congruence with these findings. Among varieties, cv. Sabnum and Snow Princes revealed statistical maximum increased in the length of spike. GA_3 treatment produced striking effect in enhancing the number of florets/spikes. GA_3 200 ppm resulted maximum number of florest/spike (13.00) 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 is also lent credence with the findings of Prakash and Jha (1998) in gladiolus. In respect to varieties cv. Sabnum exhibited maximum number of florets was reported by Gond (1997) in gladiolus. Spray of GA_3 400 ppm significantly decreased the

Table 1: Influence of GA_3 and varieties on length of longest leaf, width of longest leaf, number of leaves/hill, days taken to spike emergence, days taken to opening of first floret, days taken to colour show, length of spike and number of florets/spike

Treatment	Length of longest leaf (cm)	Width of longest leaf (cm)	No. of leaves/ hill	Days taken to spike emergence	Days taken to opening of first floret	Days taken to colour show	Length of spike (cm)	No. of florets/ spike
Control Archana	53.03	2.14	6.22	72.88	86.77	82.21	82.57	8.00
Control Gunjan	63.33	2.54	14.00	74.50	86.16	80.50	59.77	9.00
Control J.V. Gold	60.68	2.55	7.50	74.44	82.55	83.33	93.83	10.33
Control Sabnum	49.51	2.09	4.89	72.38	83.55	80.55	97.62	11.33
Control Snow Princess	61.63	2.03	7.13	72.99	87.33	82.33	93.34	11.00
GA_3 100 ppm Archana	54.38	2.26	11.55	72.88	88.21	83.66	77.74	7.33
GA_3 100 ppm Gunjan	67.25	2.83	16.16	73.16	89.83	78.33	61.16	6.67
GA_3 100 ppm J.V. Gold	62.00	2.33	8.44	74.77	82.66	82.77	94.26	10.67
GA_3 100 ppm Sabnum	76.66	1.99	12.77	67.63	80.33	80.11	97.42	10.33
GA_3 100 ppm Snow Princess	71.50	2.06	11.26	70.77	82.88	81.88	93.87	12.67
GA_3 200 ppm Archana	62.16	2.22	11.99	75.88	89.77	84.77	81.15	7.67
GA_3 200 ppm Gunjan	66.75	2.63	17.16	73.33	96.00	80.33	61.36	7.00
GA_3 200 ppm J.V. Gold	53.99	2.06	13.77	75.66	84.16	85.44	100.36	8.33
GA_3 200 ppm Sabnum	67.10	1.83	11.32	68.77	80.06	78.88	97.26	8.33
GA_3 200 ppm Snow Princess	68.06	1.80	9.56	71.66	80.83	81.77	97.54	13.00
GA_3 300 ppm Archana	52.77	1.31	11.55	81.00	91.77	84.77	81.28	6.33
GA_3 300 ppm Gunjan	63.66	2.33	15.66	72.83	83.33	78.33	67.40	5.67
GA_3 300 ppm J.V. Gold	57.45	2.29	12.99	75.77	79.82	86.10	102.30	7.33
GA_3 300 ppm Sabnum	72.32	1.82	15.10	68.77	79.30	79.22	70.53	9.33
GA_3 300 ppm Snow Princess	70.86	2.20	13.60	73.77	78.10	84.55	70.55	9.33
GA_3 400 ppm Archana	53.33	1.51	10.11	81.21	93.55	87.55	80.88	6.00
GA_3 400 ppm Gunjan	61.16	3.67	15.66	73.83	84.16	78.33	57.91	6.67
GA_3 400 ppm J.V. Gold	59.10	1.93	15.33	75.10	79.00	87.22	96.10	9.00
GA_3 400 ppm Sabnum	77.21	1.45	10.33	64.88	80.00	79.33	92.55	7.33
GA_3 400 ppm Snow Princess	66.66	1.70	9.73	75.55	82.46	86.22	92.5	11.67
SE(d)	7.49	0.27	2.11	1.27	2.08	1.16	4.48	1.23
C.D. at 5%	15.11	0.55	4.26	2.57	4.20	2.33	9.04	2.47

Table 2: Influence of GA_3 and Varieties on diameter of first floret, diameter of fifth floret, duration of flowering, number of corms/hill, weight of corms/hill, diameter of corms, number of cormels/hill and weight of cormels/hill

Treatment	Diameter of first floret (cm)	Diameter of fifth floret (cm)	Duration of flowering	No. of corms /hill	Weight of corms /hill (g)	Diameter of corms (cm)	No. of cormels /hill	Weight of cormels /hill
Control Archana	10.96	10.097	12.36	1.00	22.67	4.31	8.68	4.00
Control Gunjan	9.10	9.353	13.90	2.33	43.50	4.32	26.33	8.00
Control J.V. Gold	11.24	11.797	14.10	2.00	50.83	5.44	14.67	3.83
Control Sabnum	8.92	8.833	15.66	1.33	26.67	3.99	12.33	1.17
Control Snow Princess	9.64	10.080	13.56	2.67	66.50	4.31	19.67	5.80
GA_3 100 ppm Archana	10.86	9.160	11.23	2.33	63.17	4.76	29.33	12.00
GA_3 100 ppm Gunjan	8.65	10.397	14.66	2.67	38.17	3.98	38.33	14.67
GA_3 100 ppm J.V. Gold	12.03	12.183	15.10	2.00	41.00	4.27	9.67	1.37
GA_3 100 ppm Sabnum	8.99	9.550	15.56	1.67	64.70	4.66	31.33	1.67
GA_3 100 ppm Snow Princess	9.90	10.563	12.93	2.00	47.50	4.32	29.33	4.93
GA_3 200 ppm Archana	10.05	12.260	11.20	2.67	67.33	4.82	28.33	12.50
GA_3 200 ppm Gunjan	11.03	11.300	14.06	3.33	77.00	4.26	33.00	12.17
GA_3 200 ppm J.V. Gold	12.25	12.580	14.10	2.33	27.17	3.50	37.67	5.77
GA_3 200 ppm Sabnum	9.28	10.067	14.03	2.67	39.00	3.50	13.67	8.67
GA_3 200 ppm Snow Princess	10.46	12.733	13.33	2.00	38.83	4.16	30.67	9.03
GA_3 300 ppm Archana	11.12	11.427	11.16	1.67	30.50	4.17	24.00	7.89
GA_3 300 ppm Gunjan	9.55	9.567	14.06	1.67	39.50	4.28	50.00	15.83
GA_3 300 ppm J.V. Gold	12.93	11.263	14.96	3.00	52.27	4.02	27.67	6.30
GA_3 300 ppm Sabnum	8.83	8.800	14.50	3.67	52.67	3.96	17.33	3.50
GA_3 300 ppm Snow Princess	9.62	10.583	14.16	2.00	70.83	4.99	24.33	5.17
GA_3 400 ppm Archana	8.45	10.147	11.03	1.33	30.83	4.09	16.33	12.22
GA_3 400 ppm Gunjan	8.17	8.857	14.90	2.67	41.00	3.98	21.00	7.33
GA_3 400 ppm J.V. Gold	10.78	11.387	14.76	2.67	47.33	4.13	28.00	5.17
GA_3 400 ppm Sabnum	7.34	8.633	13.73	3.33	47.23	4.04	12.00	8.58
GA_3 400 ppm Snow Princess	9.10	8.633	13.66	1.67	42.00	4.52	24.33	5.83
SE(d)	0.76	0.93	0.92	0.66	4.44	0.44	2.90	1.53
C.D. at 5%	1.54	1.88	1.85	1.34	8.96	0.88	5.86	1.53

duration of flowering in cultivar cv. Sabnum. The results are in close conformity with the findings of Sharma *et al.,* (2006). 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. They found maximum floret diameter and length with 160 ppm GA_3 concentration. Among cultivar, cv. J.V. Gold produced maximum first and fifth floret diameters.

Corm parameters

Application of plant growth regulators resulted pronounced effect on corm and carmels production in gladiolus (Table 2). Maximum number of corms/hill (3.67) was noticed with 300 ppm GA_3 followed by 400 ppm in cv. Sabnam. Weight of corms per hill was increased with increasing concentration and application at 200 ppm produced maximum weight of corms/hill. Among varieties, cv. Gunjan produced maximum weight of corms/hill (77.00 g) when application of GA_3 concentration at 200 ppm followed by cv. Snow Princess (70.83 g) at 300 ppm. It was also superior to other. The results are in closed conformity with the findings of Arora *et al.,* (1992) observed that gladiolus cv. Aldebaran, Pusa Suhagin and Mayur exhibited differential response to GA_3 treatments in terms of size and weight of corms. Diameter of corms was significantly influenced by GA_3 treatment. GA_3 300 ppm exhibited maximum diameter of corm with cv. Snow Princess (4.99 cm). Among control cultivars, J.V. Gold showed maximum (5.44) and Archana showed minimum diameter of corms (4.31). These results are also conformity with Tawar *et al.,* (2007) and were obtained superior results after the application of GA_3 on corm production. Number of cormels/ hill was increased with increasing concentration of GA_3 and application of GA_3 300 produced maximum number of cormels per hill. Among cultivars, cv. Gunjan produced maximum number of cormels/hill (50.00) when applied GA_3 concentration at 300 ppm. The result are in close conformity with findings of Arora *et al.,* (1992). Weight of cormels/hill was significantly increased by application of plant growth regulators and gladiolus cultivars. Among cultivars, cv. Gunjan produced maximum number of cormels/hill (15.83 g) when applied GA_3 concentration at 300 ppm. Earlier work was done by Tawar *et al.* (2007) conducted an experiment to study the effect of growth regulators on corms and cormels production of gladiolus.

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