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Influence of gibberellic acid and planting date on growth and flowering in gladiolus cv. Yellow Frilled

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ABSTRACT

The present investigation was conducted during 2004-05 *rabi* season to test the influence of gibberellic acid (GA_3) and planting date on growth and flowering in gladiolus cv. Yellow Frilled, at S.D.A.U., S.K. Nagar (Gujarat). This was done in a randomized complete block design (RCBD) with three replications and analysed under factorial setup to study the interaction. Results revealed that the earliest sprouting in corm, maximum plant height, number of leaves plant^{-1}, leaf area plant^{-1}, early spike emergence, number of spikes plant^{-1} plot^{-1}, spike length, rachis length, number of florets spike^{-1}, and flowering duration were recorded in the earliest planting date, i.e., 25th October. Dipping corm in GA_3 (100pm) also proved to be the best leading to earliest corm sprouting, and various growth/flowering parameters. From these results, it is concluded that in gladiolus, planting on 25th October along with dipping of corms in gibberellic acid (100ppm) at the time of planting, is most effective for improved growth and flowering.

Key words: Gladiolus, corm-dipping, gibberellic acid, flowering, planting date, growth

INTRODUCTION

The term 'Gladiolus' is derived from the Latin word "gladius", meaning a sword-shape (leaves of the plant). It belongs to the family Iridaceae and is native to the Cape region of South Africa. It is also known as the queen of bulbous ornamentals, with majestic cut-spikes having florets of a massive form, brilliant colours, attractive shapes, varying sizes and excellent keeping-quality. It is excellent for beds, rockeries, pots, herbaceous borders and cut-flowers. Gladiolus can be cultivated on all types of soil having a good soil-texture and drainage facility. Soil pH ranging from 6.0 to 7.0 is ideal for growth and development of cut-spike production. It is a winter-season crop, but can be grown during the rainy season in low-rainfall areas experiencing a mild climate. Increase in cut-flower production and quality cut-spikes can be achieved by adopting advanced techniques like using plant growth regulators (GA_3) and adjusting the planting date. Not much work has been done on working out suitable planting date and GA_3 requirement in gladiolus under North-West Gujarat conditions. The present investigation was undertaken to arrive at the most suitable planting date and gibberellic acid concentration in gladiolus cv. 'Yellow Frilled' for optimal growth and flowering.

MATERIAL AND METHODS

The present investigation was carried out at Hi-Tech Horti-Park, Department of Horticulture, Chimanbhai Patel College of Agriculture, Dantiwada Agricultural University, Sardar Krushinagar (Gujarat) located at 24º.19' North latitude and 72º.19' East longitude at an elevation of 154.52m above MSL. It represents North Gujarat Agroclimatic region. The experiment was conducted on sandy-loam soil with pH 7.8, organic carbon 0.23%, available N 128kg ha^{-1}, P_2O_5 37kg ha^{-1} and K 218kg ha^{-1} under irrigated conditions in a plot size 0.9m x 1.8m, with a spacing of 45cm x 30cm in three replications with randomized complete block design. Before planting, the corms were treated with various levels of GA_3, viz., 0, 50 and 100ppm for 30 minutes. The corms were sown on different planting dates, viz., 25th October, 2004 (D_1), 5th November, 2004 (D_2) and 15th November, 2004 (D_3). Data was recorded for various parameters, viz., days taken to corm-sprouting, plant height and number of leaves plant^{-1} at 60 and 90 DAP; leaf area plant^{-1}, days taken to spike-emergence, number of spikes plant^{-1}, number of spikes plot^{-1}, spike length, rachis length, numbers of florets spike^{-1}, duration flower of and vase life of cut-flowers. Data were statistically analyzed as per Panse and Sukhatame (1985) at 5% level of significance.

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RESULTS AND DISCUSSION

Effect of planting date and gibberellic acid on vegetative growth parameters: Observations on days taken to corm-sprouting, plant height (30, 60 and 90 DAP), number of leaves plant^{-1} (30, 60 and 90 DAP) and leaf area per plant are presented in Table 1.

Days taken to corm-sprouting: Earliest corm-sprouting was observed in corms planted on 25th October (8.76 days), while planting on 15th November delayed corm-sprouting. Application of 100ppm GA_3 resulted in increased spike-length and this is in agreement with Moazzam *et al* (2011) in tuberose; Bhattacharjee (1984) Awad and Hamid (1985), Mukhopadhyay and Bankar (1986) and Ravidas *et al* (1992) in gladiolus. The effect of GA_3 in increasing rachis length was in agreement with findings of Bhattacharjee (1984) and Ravidas *et al* (1992) in gladiolus. Number of days taken to corm-sprouting increased with delay in planting date, which may perhaps be due to low winter-temperatures. Similar results were obtained by Saini *et al* (1988) who observed that late planting took significantly longer to induce corm-sprout compared to early planting, due to low temperature and this was further supported by Laskar and Jana (1994) in gladiolus.

Corm-sprouting was significantly affected by gibberellic acid. Number of days taken to sprout was inversely proportional to the concentration of gibberelic acid. Sprouting was early with GA_3 100ppm (8.36 days). Similar results were reported by Janowska *et al* (2009) in *Anemone coronaria* L.

Table 1. Effect of planting date and GA_3 concentration on vegetative growth in gladiolus cv. Yellow Frilled

Gibberellic acid conc.	Days taken to sprout	Plant height (cm) 90 DAP	No. of leaves 90 DAP	Leaf area (cm^2)
Control (0ppm)	10.24	95.70	8.78	147.57
G_1 (50ppm)	9.00	97.79	9.33	156.53
G_2 (100ppm)	8.36	99.03	9.51	160.72
SEm ±	0.11	0.66	0.12	1.23
CD (*P=0.05*)	0.33	1.98	0.37	3.70
Planting date				
D_1 (25th Oct.)	8.76	103.30	10.26	161.36
D_2 (5th Nov.)	9.23	96.20	9.04	153.25
D_3 (15th Nov.)	9.61	93.02	8.32	150.21
SEm ±	0.11	0.66	0.12	1.23
CD (*P=0.05*)	0.33	1.98	0.37	3.70
D x G				
SEm ±	0.19	1.14	0.22	2.14
C.D. (*P=0.05*)	NS	NS	NS	NS

NS = Non-significant

Plant height: Maximum plant height at 90 days after planting was recorded in corms planted on 25th October (103.30 cm). Significant increase in plant height was achieved with gibberellic acid treatment. Greater plant height gained in early planting may be due to favourable climatic conditions, particularly higher temperature, prevailing during this period under Sarkar Krushinagar conditions. Similar observations were also recorded by Dod *et al* (1989) in gladiolus. Gaastra (1980) reported that with soil moisture and light as non-limiting, higher temperatures accelerated growth. This response is in agreement with results obtained in gladiolus by Mahesh and Misra (1993), Mohanty *et al* (1994) and Delvadia *et al* (2009) with application of 250 ppm GA_3 in *Gaillardia pulchella.*

Number of leaves per plant: Number of leaves plant^{-1} was significantly higher in 25th October planted corms compared to the other two treatments (Table 1). Gibberellic acid treatment too increased leaf number significantly.

Leaf area per plant: Data reveal that leaf area plant^{-1} was significantly greater in corms planted on 25th October (161.36 cm^2), while delayed planting reduced leaf area in 5th November (153.25 cm^2) and 15th November (150.21cm^2) plantings, respectively. The present results are in close conformity with Misra (1997) who found higher leaf length in 30th October plantings in gladiolus. Leaf area plant^{-1} was also higher in GA_3 100ppm (160.72 cm^2) application, followed by GA_3 50ppm (156.53 cm^2), while, minimum leaf area plant^{-1} was observed in the Control. GA_3 @50-100ppm as foliar spray 40 days after bulb-planting in tuberose resulted in increased leaf length, as reported by Moazzam *et al* (2011).

Effect of planting date and gibberellic acid on flowering characters: In Table 2, data indicates various flower characters like days taken to spike-emergence, number of spikes plant^{-1}, number of spikes plot^{-1}, spike length, rachis length, number of florets spike^{-1}, flower-duration and vase life of cut-spikes. Results are discussed under sub-heads.

Days taken to spike-emergence: Number of spikes, number of florets, length of rachis and length of spike were significantly higher in 25th October planting, and in GA_3 (100 ppm) treated corms, compared to late plantings or in other GA treatments. These findings are in line with those of Saini *et al* (1988) and Dod *et al* (1989) in gladiolus. Stimulating effect of gibberellins in flower development has also been described by Mittal (1967), Biswas *et al* (1983) and Jana and Biswas (1982).

Table 2. Effect of planting date and gibberellic acid concentration on flowering in gladiolus cv. Yellow Frilled

Gibberellic acid conc.	No. of spikes per plant	Length of spike (cm)	Length of rachis (cm)	Days taken to spike emergence	No. of florets per spike	Duration of flower	Vase life (days)
G_1 (0 ppm)	1.04	56.26	30.51	78.32	8.28	9.44	6.22
G_2 (50 ppm)	1.16	61.08	32.56	76.44	8.88	10.11	7.44
G_3 (100 ppm)	1.33	65.02	34.86	74.61	9.63	10.56	7.67
SEm ±	0.05	1.84	0.65	0.53	0.23	0.17	0.25
C.D. (*P=0.05*)	0.16	5.50	1.95	1.58	0.68	0.51	0.76
Planting date							
D_1 (25th Oct.)	1.38	66.21	37.50	75.00	10.36	10.78	7.44
D_2 (5th Nov.)	1.18	62.53	31.77	76.59	8.93	10.33	7.33
D_3 (15th Nov.)	0.98	53.61	28.66	77.79	7.50	9.00	6.56
SEm ±	0.05	1.84	0.65	0.53	0.23	0.17	0.25
C.D. (*P=0.05*)	0.16	5.50	1.95	1.58	0.68	0.51	NS
D x G							
SEm ±	0.09	3.18	1.13	0.92	0.39	0.29	0.44
C.D. (*P=0.05*)	NS	NS	NS	NS	NS	NS	NS

NS = Non-significant

Earlier planting may have helped increase photosynthesis, energy available and accelerated for metabolism development of floral characters (Arora and Sandhu, 1987). The present findings are closer to results of Bankar and Mukhopadhyay (1980) who reported that October – November planting of gladiolus resulted in the best quality cut-spikes (spike length, rachis length, number and size of florets). This is further supported by Khanna and Gill (1983).

Positive effect of gibberellic acid on number of florets per spike, flower-size and flower uniformity was reported by Runkle (2006), Ravidas *et al* (1982) and Mahesh and Misra (1993) in gladiolus, while, Jana and Biswas (1982) and Biswas *et al* (1983) reported the same in tuberose.

Flower duration: Longer duration was observed in October 25th planting, followed by November 5th planting. The present findings are in conformity with those of Misra (1997) and Mahesh and Misra (1993), also in gladiolus. Spike emergence was earlier in 25th October planting and with 100ppm GA_3 treatment.

Vase life of cut-spikes: Highest vase-life of cut-spikes was obtained in early planting, viz., 25th October (7.44 days) compared to late planting, ie., 15th November (6.56 days). Vase life of cut-spikes significantly improved with increasing levels of GA_3 in corm-dipping treatment. Vase life of cut-spikes was also associated with maintenance of fresh weight, size of opened floret, uptake of water, longevity of open floret, pulsing, biocide and number of open florets per spike. Mohanty *et al* (1994) reported increased vase-life in gladiolus in corms treated with growth regulators. GA3 reduced water loss and had anti-senescence properties, leading to enhanced shelf-life of flowers (Singh *et al*, 1994).

Interaction effect between planting date and gibberellic acid on various growth and flowering characters in gladiolus was found to be non-significant.

From the present investigation, it is concluded that gladiolus planting on 25th October along with corm-dip in gibberellic acid @ 50ppm for 30 minutes at the time of planting, is the most effective for improved the growth and flowering under North Gujarat conditions.

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