Research Article

Effect of Planting Dates and Varieties on Growth and Flowering on Gladiolus (*Gladiolus hybridus* Hort.) Under Sub-Humid Zone of Rajasthan

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Abstract

A field experiment was conducted during winter season of 2015-16 to study "Effect of Planting Dates and Varieties on Growth and Flowering on Gladiolus (*Gladiolus hybridus* Hort.) under sub-humid zone of Rajasthan" having 15 treatment combinations of five Varieties (V_1- African Star, V_2- Hunting Song, V_3- Legend, V_4- Pusa Srijana and V_5- Snow Princess) and three planting dates (D_1- 10th October, D_2- 25th October and D_3- 9th November). The treatment V_2D_1 (Hunting Song + 10th October planting) recorded the maximum plant height (116.10 cm), highest number of leaves per plant (8.77), main stem diameter (1.50 cm), minimum days to spike emergence (59.33days), minimum days to first floret opening (13.20 days) maximum number of spike per plant (3.21), number of spikes per plot (28.95) and number of spike per hectare (3.61 lakh). While the maximum leaf length and leaf width was found in (V_5D_3). The growth and flowering was found superior in compare to other planting dates.

Keywords: varieties, planting dates, gladiolus, spike

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Introduction

Gladiolus (*Gladiolus hybridus* Hort.) is an important cut flower crop, grown commercially in many parts of the world. It has gained popularity owing to its incomparable beauty, attractive colours, various sizes and shapes of florets, variable spike length and long vase life. Gladiolus produces beautiful spikes from December to March in the plains and from June to September in the hills of India. The genus *Gladiolus* belongs to family Iridaceae and comprises about 250 species with more than 10,000 cultivars out of which about 20 species are grown commercially for cut flower purpose. It has the basic chromosome number n=15. European species are tetraploids have chromosome ranges from 2n=30 to 120 (diploid, triploid, tetraploid, pentaploid, hexaploid, octaploid and hyper aneuploid). The genus was named by Tournefort and the generic name is derived from the Latin word 'gladius' meaning 'sword' on account of the sword-shaped foliage. Gladiolus was also called 'xiphium' based on the greek word 'Xiphos' also meaning sword. It is herbaceous bulbous plants which develop from axillary buds on the corm. The leaves of the plant overlap at the base depending on types the number varies from 1 to 12. The inflorescence is a spike and originates as a terminal axis and the floret number may be up to 20 or more [1].

Date of planting plays an important role in regulating growth and quality of gladiolus. Vegetative growth and quality of gladiolus is improved by proper planting times which also satisfy the consumer's demands [2]. Different planting schedule supply gladiolus steadily to the market as well as it adds to the beauty of the landscape longer. The timing of flowering from various planting dates is quite predictable under ideal environmental conditions. The growth and yield of gladiolus like other plants depend upon planting time e.g., number of florets/spike, spike length, floret diameter, floret length was best with October planting [3]. However, much experiment was conducted on different planting dates and varieties but under sub humid zone of Rajasthan no precise study was conducted on different planting dates with varieties on gladiolus. The following found best planting dates with varieties.

Materials and Methods

A field experiment was conducted during winter season of 2015-16 at College of Horticulture & Forestry, Jhalawar. Corms of gladiolus cultivars were collected from College of Horticulture and forestry, Jhalawar (Rajasthan). Healthy

and uniform size corms of 4-5 cm diameter were planted at different planting dates. The experiment consisted of 15 treatment combinations (V_1D_1, V_1D_2, V_1D_3, V_2D_1, V_2D_2, V_2D_3, V_3D_1, V_3D_2, V_3D_3, V_4D_1, V_4D_2, V_4D_3, V_5D_1, V_5D_2, V_5D_3) comprising of five varieties (V_1- African Star, V_2- Hunting, V_3- Legend, V_4- Pusa Srijana and V_5- Snow Princess) and Three planting date (D_1- 10th October, D_2- 25th October and D_3- 9th November) laid out in split plot design with three replications. The observations plant height was recorded in centimeters from ground to tip of the spike, Leaf length and leaf width recorded in centimeter, number of leaves produced was counted after emergence of spike, length of 4th leaf from base to tip of the leaf and stem diameter was measured with the help of digital vernier calipers. The number of spikes produced per mother corm, number of spikes produced per plot was counted.

Statistical analysis: The experimental data are to be recorded during the course of investigation for various characters under study with appropriate statistical analysis [4] along with suitable interpretation.

Result

The growth and flowering characters differed significantly for the varieties, planting dates and interaction of varieties x planting dates (**Table 1** and **2**).The maximum plant height (112.81 cm), highest number of leaves per plant (8.51), main stem diameter (1.47 cm), minimum days to spike emergence (63.51days), minimum days to first floret opening (13.83 days) maximum number of spike per plant (2.73), number of spikes per plot (24.64) and number of spike per hectare (3.07 lakh). The growth and flowering was found superior in 'Hunting Song' compare to other planting dates. While the maximum leaf length (61.97 cm) and leaf width (4.57 cm) was found in 'Snow Princess' (V_5).

Table1 Effect of planting dates and varieties on vegetative growth of gladiolus

Treatment	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf Width (cm)	Main stem diameter (cm)
Varieties					
V_1	96.22	7.11	53.93	2.44	1.14
V_2	112.81	8.51	52.40	2.88	1.47
V_3	100.99	8.47	57.63	3.27	1.31
V_4	98.77	7.48	49.50	3.27	1.37
V_5	105.92	7.44	61.97	4.57	1.20
CD at 5%	5.69	0.40	6.57	0.37	1.10
Planting dates					
D_1	106.79	8.04	52.34	3.16	1.38
D_2	104.53	7.82	55.8	3.30	1.28
D_3	97.51	7.55	57.24	3.40	1.20
CD at 5%	5.98	0.25	3.28	0.38	1.11
Interaction					
V_1D_1	102.66	7.21	48.8	2.33	1.20
V_1D_2	101.44	7.11	58.4	2.42	1.10
V_1D_3	84.55	7.0	54.6	2.56	1.00
V_2D_1	116.10	8.77	48.0	2.80	1.5
V_2D_2	114.66	8.55	56.1	2.80	1.5
V_2D_3	107.66	8.22	53.1	3.04	1.4
V_3D_1	102.66	8.66	57.4	3.13	1.5
V_3D_2	101.99	8.55	59.7	3.31	1.2
V_3D_3	98.33	8.21	55.8	3.37	1.2
V_4D_1	103.77	7.77	49.4	3.39	1.4
V_4D_2	99.77	7.33	47.8	3.36	1.4
V_4D_3	92.77	7.33	51.3	3.05	1.3
V_5D_1	108.77	7.77	58.1	4.14	1.3
V_5D_2	104.77	7.55	63.6	4.60	1.2
V_5D_3	104.22	6.99	64.2	4.96	1.1
CD at 5%	10.36	0.43	5.68	0.66	2.10 (NS)

Table 2 Effect of planting dates and varieties on flowering of gladiolus

	Days to spike emergence	Days to first floret opening	No. Spike per plant	No. Spike per plot	No. Spike per Hectare (Lakhs)
Varieties					
V_1	70.15	15.17	2.58	22.00	2.74
V_2	63.51	13.83	2.73	24.64	3.07
V_3	70.92	15.17	1.99	15.03	1.87
V_4	67.07	14.77	1.99	13.97	1.74
V_5	63.66	14.26	2.18	17.47	2.18
CD at 5%	3.41	0.23	0.53	4.61	5.76
Planting dates					
D_1	63.57	13.96	2.66	21.53	2.69
D_2	67.24	14.64	2.28	18.51	2.31
D_3	70.37	15.50	1.95	15.83	1.97
CD at 5%	2.97	0.83	0.35	2.47	3.09
Intrection					
V_1D_1	65.66	13.9	2.88	24.50	3.06
V_1D_2	71.33	14.9	2.66	22.63	2.84
V_1D_3	73.55	17.6	2.22	18.87	2.35
V_2D_1	59.33	13.2	3.21	28.95	3.61
V_2D_2	65.66	13.9	2.66	23.97	2.99
V_2D_3	65.22	14.4	2.33	21.00	2.62
V_3D_1	69.11	15.0	2.55	19.15	2.39
V_3D_2	69.89	15.2	1.99	14.97	1.87
V_3D_3	73.77	15.3	1.44	10.98	1.35
V_4D_1	64.22	14.1	2.22	15.54	1.94
V_4D_2	66.55	14.8	1.88	13.20	1.65
V_4D_3	70.44	15.4	1.88	13.18	1.64
V_5D_1	59.66	13.6	2.44	19.50	2.44
V_5D_2	62.77	14.4	2.22	17.80	2.22
V_5D_3	68.89	14.8	1.88	15.10	1.88
CD at 5%	5.45	1.45	0.61	4.27	5.35

The maximum plant height (106.97 cm), highest number of leaves per plant (8.04), main stem diameter (1.38 cm), minimum days to spike emergence (63.57days), minimum days to first floret opening (13.96 days) maximum number of spike per plant (2.66), number of spikes per plot (21.53) and number of spike per hectare (2.69 lakh). The growth and flowering was found superior in 10th October planting date (D_1) compare to other planting dates. While the maximum leaf length (57.24 cm) and leaf width (3.40 cm) was found in 9th November planting dates (D_3).

The interaction of varieties & planting dates had the maximum plant height (116.10 cm), highest number of leaves per plant (8.77), main stem diameter (1.50 cm), minimum days to spike emergence (59.33days), minimum days to first floret opening (13.20 days) maximum number of spike per plant (3.21), number of spikes per plot (28.95) and number of spike per hectare (3.61 lakh). The growth and flowering was found superior in 'Hunting Song' + 10th October planting dates (V_2D_1) compare to other planting dates. While the maximum leaf length (64.2 cm) and leaf width (4.96 cm) was found in Snow Princess + 9th November planting dates (V_5D_1).

Discussion

The variation in plant height of different date of planting may be due to development of better root system and luxuriant growth which resulted large quantity of photosynthates under such favorable condition [5, 6]. Plant height depends upon the genetic constitution. The variation in plant height among the various varieties might be due to genotypic differences in phenotypic expression of plant height [7-9].

Higher number of leaves in early planting could be attributed to optimum time of planting and nutrient for growth of plants [1] in Tuberose [10, 11]. Further the variation in number of leaves per plant among the varieties might be due to the genotype influence on phenotypic expression of general vigor of plants as evident from the results on plant height, number and size of leaves and corms. The maximum number of leaves per plant in October was the result of the finding that at the time the plants might had acquired maximum efficiency for development due to ideal condition. Earlier planting produced the well-developed plants of gladiolus [12]. Variation in number of leaves per plant in different genotypes has also been reported in gladiolus [13].

The variation in leaf length of the varieties might be due to their genetic make-up [14]. Similar findings on variation in leaf size of different varieties have been reported in gladiolus [15-17]. The favorable effect of 9th November planting on leaf length might be due to less number of leaves of the plant due to higher photosynthetic activity and ultimately enhanced plant growth and the leaf length [18].

The variation in leaf width might be due to variability in genetic constitution of the varieties stimulating leaf width might be due to triggering higher photosynthetic activities which might have favored cell division and cell enlargement which ultimately enhanced the size of leaves [19].

The production of strong and sturdy stem or thin and week stem might be due to genetic makeup of varieties which could have been further affected by environmental condition [20, 21]. Further, thicker stems in early planting could be attributed to stronger and sturdier growth of plants due to developed better root system and maximum photosynthesis under such favorable condition [10, 12].

Spike emergence might have been primarily dependent upon the food reserve in the plant that could be related to growth rate of plant regulating accumulation of carbohydrates for slipping [17]. It could be assumed that the varieties developing food reserves early and faster might have early emergence of spikes [22]. The early spike emergence in October planting due to provide favorable climatic condition during & optimum temperature and moderate day length [23].

Variation in time required for first floret opening from spike emergence might be attributed to the genetic constitution of varieties which govern the vegetative and reproductive growth and phase [24, 25].

The early planting of corms increased vegetative growth particularly greater leaf production with larger size resulting in improved photosynthesis and translocation of photosynthetic towards sink may have also increased number of spikes [26].

The number of spikes per plant might be due to variability in genetic constitution of the varieties controlling the apical dominance and intensity of the dormancy due to endogenous hormonal level, governing the number of sprouts per planted corm. The October planted crop might be exposed to relatively long day conditions than other date of planting, which might have resulted increased photosynthesis translocation to sink to increase flowering parameters and thus might increase yield.

The spike yield per hectare appeared to positively correlated with spike yield per plot as the estimated spikes per hectare was gradually increased with early planting of corm and genetic constitute of variety [27].

Conclusion

The Effect of Planting Dates and Varieties on Growth and Flowering on Gladiolus (*Gladiolus hybridus* Hort.) Under Sub-Humid Zone of Rajasthan. The best growth behavior/plant was obtained under early plantation by widening the planting distances. Early planting date and close planting distance positively affected the seeds and oil yield/fed. This study opens a path for further specific studies on suitable agronomical conditions to reach the production quality of this economical plant.

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