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Influence of corm size and spacing on growth and yield of gladiolus under Nilgiris condition

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Abstract

Gladiolus is one of the most popular ornamental bulbous plants grown in many parts of the world as cut flower and bedding plant for its bewitching flowers. It is an emerging cut flower with enormous potential to be used extensively. The present study was conducted to standardize corm size and spacing in order to obtain quality produce to meet the quality standards. The corms of gladiolus cv. White Prosperity of three size group (01-10, 11-20, 21-30 g) were planted in three spacing (40×20 , 30×30 , 30×20 cm²) and data were recorded on vegetative, flowering and corm production. The research revealed the days taken for 80% emergence of the crop, plant height at flowering (cm), leaf length at flowering (cm), rachis length (cm), floret length (cm), number of florets/ spike, no. of corms/plant, average corm weight (g), average corm diameter (cm) were found superior in gladiolus corm of size 21-30 g planted at a spacing of 40×20 cm² under Nilgiris condition.

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Introduction

Gladiolus a popular bulbous cut flower belongs to the family Iridaceae with 255 species. It is one of the most popular ornamental bulbous plants grown in many parts of the world as cut flower and bedding plant for its bewitching flowers. It occupies a significant position in the international cut flower trade. The Gladiolus cv. White Prosperity posses sword shaped leaves with thickened margins and midrib. In India

gladiolus is grown in an area of about 11,660 ha with an estimated production of 106 crore cut flowers. Amongst the cut flowers, gladiolus occupied third position in terms of both area and production. In India, major gladiolus producing states are Uttar Pradesh, West Bengal, Odisha, Chhattisgarh, Haryana & Maharashtra. Gladiolus is also grown in states like Uttarakhand, Karnataka, Andhra Pradesh and Sikkim.

Even though gladiolus is mainly a winter season flower crop, in areas having moderate climatic conditions, gladiolus can be grown throughout the year (NABARD 2016). The quality of spikes, productivity, corms and cormels produced are known to influence by several factors such as cultivar, nutrition and plant density and size of the planting material. Thus, the present study was undertaken with the aim of optimizing two important requirements for commercial cultivation *viz.*, corm size and plant spacing for cultivation of gladiolus in the Nilgiris district of Tamil Nadu. Owing to the prevalence of sub temperate climate in the Nilgiris of Tamil Nadu attempts are in process for the commercialization of gladiolus production in Tamil Nadu.

Materials and Methods

The experimental site was located at Woodhouse Farm of Horticultural Research Station, Ooty at an altitude of 2,500 m at altitude. The location is found under average climatic condition of 15 to 17°C with a relative humidity of 80 to 85 per cent during the experimental period. The experiment was carried out in Factorial Randomized Block Design (FRBD) with 2 factors at 3 level each *viz.*, 1st factor - corm size (1-10, 11-20 and 21-30 g) and 2nd factor – spacing (40 × 20, 30 × 30, 30 × 20 cm²), respectively. The corms were uniformly planted at a depth of 5 cm during the month of November 2017 which were treated with ethrel at 100 ppm. Observations were recorded on the vegetative and yield and corm parameters during flowering stage. The recorded observation

were analyzed statistically with AGRES software package, MS excel spreadsheet.

Results and Discussion

Vegetative characters

The data pertaining to the effect of corm size and spacing on vegetative parameters are presented in Table.1. The results clearly indicated a significant influence of corm size and spacing on days taken for 80% emergence of the crop. It was found as the corm size and spacing increases the days taken for sprouting decreases. The 80% emergence of the crop found earlier flowering in large corms (21-30 g) in 23.97 days and wider spacing of (40 x 20 cm) 23.96 days and delayed emergence was recorded in small corms (01-10 g) 27.04 days and narrow spacing of (30 x 20 cm) 27.13 days was recorded. On interaction large corms (21-30 g) planted at the widest spacing (40 x 20 cm) recorded the earliest sprouting 23.65 days which was found to be on par with large corms at medium spacing (30 x 30 cm) 23.73 days against the small corms (01-10 g) planted at the narrowest spacing (30 x 20 cm) recorded the most delayed sprouting of 29.40 days.

The maximum plant height was recorded in large corms (21-30 g) 96.52 cm and wider spacing at (40 x 20 cm) 96.03 cm and minimum plant height was recorded in small corms (01-11 g) at 86.24 cm and at narrow spacing of (30 x 20 cm) 89.17 cm, where on interaction maximum plant height was recorded in large corms (21-30 g) planted at the widest spacing (40 x 20 cm) as 101.24

cm followed by large size corm (21-30 g) with medium spacing (30 x 30 cm) of 97.31cm and the smallest corms (01-10 g) planted at the narrowest spacing (30 x 20 cm) recorded the minimum plant height of 81.23 cm.

The maximum leaf length was recorded in large corms (21-30 g) of 35.85 cm and widest spacing (40 x 20 cm) of 35.45 cm and the minimum leaf length was recorded in small corms (01-11 g) 29.02 cm and narrow spacing of (30 x 20 cm) as 29.69 cm. On interaction the maximum leaf length was recorded in large corms (21-30 g) planted at the widest spacing (40 x 20 cm) recorded the 37.89 cm followed by large size corm (21-30 g) with medium spacing of (30 x 30 cm) of 35.89 cm which was found to be on par with medium size corm (11-20 g) planted at wider spacing of (40 x 20 cm) 35.37 cm and the smallest corms (01-10 g) planted at the narrowest spacing (30 x 20 cm) recorded the minimum leaf length of 25.44 cm.

Large corm size directly influences the acceleration of growth of the plants which results in earlier sprouting of corms that attributes to the higher quantity of reserve food materials in the corm. Under wider spacing the competition between the plants for nutrients and light is comparatively less and hence the decline in growth under lesser spacing may be due to higher competition of plants for soil, nutrient and other factors. These results were found to similar with the work done by Mollah et al. (1995) and Kareem et al. (2013) in gladiolus (Table.1)

Floral characters

Flower quality was also significantly influenced by corm size and spacing and the data is presented in Table 2. The maximum rachis length was recorded in medium corms (11-20 g) of 42.65 cm and widest spacing of (40 x 20 cm) 44.57 cm and the minimum rachis length was recorded in large corms of (21-30 g) 41.19 cm and medium spacing of (30 x 30 cm) 41.44 cm. On interaction the maximum rachis length was recorded in large corms (21-30 g) planted at the widest spacing (40 x 20 cm) of 45.43 cm which was on par with medium sized corm (11-20 g) planted at widest spacing of (40 x 20 cm) 45.20 cm and the medium sized corms (11-21 g) planted at the medium spacing (30 x 30 cm) recorded the minimum rachis length of 40.67 cm.

Floret length was found to be maximum in large sized corm (21-30 g) of 9.41 cm and in widest spacing (40 x 20 cm) of 9.44 cm and the minimum floret length was found in small corms of (01-11 g) 8.88 cm and narrow spacing of (30 x 20 cm) 8.83 cm, whereas the interactions between the spacing and the corm size were not found to be significant in floret length of Gladiolus cv. White Prosperity. The chance for availability is higher which enhances the growth and yield. The maximum number of florets / spike was recorded in large corms of (21-30 g) 14.31 and widest spacing of (40 x 20 cm) 14.66 and the minimum number of florets / spike was recorded in small corms of (01-10 g) 10.35 and narrow spacing of (30 x 20 cm) 10.32. On interaction the maximum number of florets / spike was recorded in large corms of (21-30 g) planted at the widest spacing (40 x 20 cm) of 16.66 followed by large sized corm

(21-30 g) planted at medium spacing of (30 x 30 cm) recorded 14.65 which was on par with medium sized corms (11-20 g) planted at widest spacing of (40 x 20 cm) 14.63 and the minimum number of florets / spike was recorded in small corm (01-11 g) planted at narrow spacing of (30 x 20 cm) 8.67. the enhanced quality parameter of flower were found in plants from larger corms planted at wider spacing which might be due to less competition between plants for water, mineral, nutrition and light enabling favourable photosynthesis and translocation of assimilates to the reproductive organs coupled with synthesis of growth hormones leading to production of longer flower spikes. The results were found to be in consonance with Bisen (2013).

Corm parameters

The results pertaining to corm parameter are presented in Table 3, which indicated a significant influence of corm size and spacing on maximum number of corms / plant was recorded in large corms (21-30 g) of 1.88 and wider spacing (40 x 20 cm) of 1.76 and minimum number of corms / plant was recorded in small corms (01-10 g) of 1.31 and the narrow spacing of (30 x 20 cm) 1.34. On interaction maximum number of corms / plant was recorded in large corms (21-30 g) planted at the widest spacing (40 x 20 cm) of 2.01 followed by large sized corm (21-30 g) planted at medium spacing of (30 x 30 cm) recorded 1.91 and the minimum number of corms were recorded in small sized corms (01-10 g) planted at narrow spacing (30 x 20 cm) of 1.01.

The average corm weight was recorded higher in large corms (21-30 g) of 22.08 g and widest spacing of (40 x 20 cm) 21.33 and average corm weight was recorded lower corm weight was recorded in small corms (01-10 g) of 12.33 g and narrow spacing of (40 x 20 cm) 12.86 g, in case of interaction the average corm weight was recorded higher in large corms (21-30 g) planted at the widest spacing (40 x 20 cm) of 30.16 g followed by medium sized corm (11-20 g) planted at widest spacing of (40 x 20 cm) recorded 27.10 g and the minimum weight of corms were recorded in small sized corms (01-10 g) planted at widest spacing (40 x 20 cm) of 6.73 g. The average corm diameter was recorded higher in large corms (21-30 g) of 4.82 cm and widest spacing of (40 x 20 cm) 5.13 cm and minimum corm diameter was recorded in small corms (01-11 g) of 3.85 cm and narrow spacing of (30 x 20 cm) 3.40 cm, whereas on interaction the average corm diameter was recorded higher in large corms (21-30 g) planted at the widest spacing (40 x 20 cm) of 5.70 cm followed by medium sized corm (11-20 g) planted at widest spacing of (40 x 20 cm) of 5.14 and the minimum diameter of corms were recorded in small sized corms (01-10 g) planted at widest spacing (40 x 20 cm) of 3.18 cm. This might be due to the fact that higher the larger mother corms planted at wider spacing might have enhanced the rate of photosynthesis followed by subsequent translocation of assimilates to the storage organs. These observations are supported by earlier reports on gladiolus by Kumar *et al.* (2016) and Ahmed *et al.* (2010) wherein wider spaced plants produced corms with greater diameter.

Table 1. Effect of corm size and plant spacing on vegetative parameters in Gladiolus cv. white prosperity

Treatment	Days taken for 80% emergence of the crop				Plant height at flowering (cm)				Leaf length at flowering (cm)			
Corm Size & Spacing	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean
S ₁ : 40x20 cm	23.65	24.11	24.14	23.96	101.24	95.61	91.25	96.03	37.89	35.37	33.11	35.45
S ₂ : 30x30 cm	23.73	25.45	27.59	25.59	97.31	90.25	86.25	91.27	35.89	31.21	28.53	31.87
S ₃ : 30x20 cm	24.54	27.44	29.40	27.13	91.03	95.25	81.23	89.17	33.77	29.86	25.44	29.69
Mean	23.97	25.66	27.04	25.56	96.52	93.70	86.24	92.16	35.85	32.14	29.02	32.34
	SE(d)	CD (0.05)	CD (0.01)		SE(d)	CD (0.05)	CD (0.01)		SE(d)	CD (0.05)	CD (0.01)	
Spacing (S)	0.34	0.72	0.99		0.93	1.98	2.73		0.45	0.96	1.32	
Corm size (C)	0.34	0.72	0.99		0.93	1.98	2.73		0.45	0.96	1.32	
Interaction (S × C)	0.59	1.25	1.72		1.62	3.44	4.74		0.78	1.66	2.29	

Table 2. Effect of corm size and plant spacing on floral parameters in Gladiolus cv. white prosperity

Treatment Corm Size & Spacing	Rachis length (cm)				Floret length (cm)				Number of florets/ spike			
	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean
S ₁ : 40x20 cm	45.43	45.20	43.09	44.57	9.67	9.41	9.26	9.44	16.66	14.63	12.38	14.66
S ₂ : 30x30 cm	41.16	42.10	41.07	41.44	9.43	9.19	8.88	9.16	14.65	12.34	10.00	12.33
S ₃ : 30x20 cm	41.19	40.67	42.77	41.54	9.13	8.87	8.51	8.83	11.31	10.98	8.67	10.32
Mean	41.19	42.65	42.31	42.52	9.41	9.15	8.88	9.15	14.31	12.65	10.35	12.44
	SE(d)	CD (0.05)	CD (0.01)		SE(d)	CD (0.05)	CD (0.01)		SE(d)	CD (0.05)	CD (0.01)	
Spacing (S)	NS	NS	NS		0.10	0.21	0.29		0.15	0.33	0.46	
Corm size (C)	0.51	1.08	1.49		0.10	0.21	0.29		0.15	0.33	0.46	
Interaction (S × C)	0.88	1.87	2.58		NS	NS	NS		0.27	0.58	0.79	

Table 3. Effect of corm size and plant spacing on corm parameters in Gladiolus cv. white prosperity

Treatment	No. of corms/plant				Average corm weight (g)				Average corm diameter (cm)			
Corm size Spacing	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean	C ₁ Large (21-30g)	C ₂ Medium (11-20g)	C ₃ Small (01-10g)	Mean
S ₁ : 40x20 cm	2.01	1.71	1.56	1.76	30.16	27.10	6.73	21.33	5.70	5.01	4.59	5.13
S ₂ : 30x30 cm	1.91	1.57	1.37	1.61	21.40	19.59	18.73	19.90	5.14	4.41	3.80	4.45
S ₃ : 30x20 cm	1.73	1.30	1.01	1.34	14.70	12.37	11.53	12.86	3.62	3.41	3.18	3.40
Mean	1.88	1.52	1.31	1.57	22.08	19.68	12.33	18.03	4.82	4.30	3.85	4.32
	SE(d)	CD (0.05)	CD (0.01)		SE(d)	CD (0.05)	CD (0.01)		SE(d)	CD (0.05)	CD (0.01)	
Spacing (S)	0.02	0.04	0.06		0.23	0.49	0.68		0.04	0.10	0.14	
Corm size (C)	0.02	0.04	0.06		0.23	0.49	0.68		0.04	0.10	0.14	
Interaction (S × C)	0.03	0.08	0.11		0.40	0.85	1.18		0.08	0.18	0.24	

Conclusions

From the results of the experiment, it has been found that large corm (21-30 g corm weight) planted at a spacing of 40 x 20 cm resulted in the earliest corm sprouting (23.65 days for 80% sprouting), maximum plant height at flowering (101.24 cm), highest number of florets/spike (16.66) and higher number of corms (2.01) in *Gladiolus* cv. White Prosperity. Thus it can be concluded that widest spacing and larger the corm size, gives a potential increase in yield and it is recommended for the growers in the Nilgiris district for higher benefit and production of quality produce.

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