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Article

Effect of spacing and corm size on growth and spike production of gladiolus

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Abstract: Gladiolus is high demandable and popular flower all over the world. The present study was conducted to investigate the effect of plant spacing and corm size on growth and spike production of gladiolus. The two factor experiment was laid out in Randomized Complete Block Design (RCBD). Three plant spacing like S_1= 25×20 cm, S_2= 20×30 cm and S_3= 25×30 cm and corm size like L_1=Small corm, (30±2 g), L_2=Medium corm (35±2 g), L_3=Large corm (>40g) were maintained to investigate the study. Plant spacing and corm size had significant effect on days to 80% emergence, plant height, number of leaves, days required for first spike initiation, spike length, rachis length, number of florets per spike and weight of spike. The highest number of plant height (74.61 cm), maximum number of leaves (7.98), top most length of spike (70.00), utmost rachis length (48.77 cm), largest number of florets per spike (14.33) and maximum weight of spike (35.60) were obtained from the plant spacing 25x30cm and largest corm size > 40g. Therefore, the results of the present study revealed that widest plant spacing 25×30 cm and large corm (>40g) were found to be the best for growth of spike production of gladiolus.

Keywords: spacing; corm; growth; gladiolus spike

1. Introduction

Gladiolus (*Gladiolus grandiflorus*), is a most common and popular commercial in the world. The family of gladiolus is *Iridaceae,* which also known as queen of bulbous flowers, as there is no flower to surpass its beauty in the cut flower industry. It is also known as “Sword lily” because of the shape of its leaves. It is grown extensively in the tropical, subtropical and temperate regions of the world. It is an important cut-flower in both domestic and international market (Chanda *et al.,* 2000). Yield as well as quality of flower spikes and daughter corms depends on several factors, of which size of the mother corm and spacing, play an important role. However, number of spikes, corms and cormels produced per plot is affected by plant spacing (Singh and Bijimol, 2003). The performance of these crops is greatly influenced by spacing. Spacing has been found to influence growth, flowering and yield of crom in gladiolus (Mukhopadhyay and Yadav, 1984). The optimum spacing helps not only in obtaining good quality cut flowers but also in better utilization of land, providing good open position for sunlight, soil moisture conservation, weed control and availability of nutrients vital for successive crop production and quality (Sanjib *et al.,* 2002). Several researches have been done on plant spacing and corm size both in nationally and internationally. For example, Bose (1984) suggested a spacing of 30×10 cm for the variety Oscar at West Bengal, India. Banker and Mukhopadhyay (1980) recommended a spacing of 20×20 cm for the variety “Friendship” at Bangalore, India. Patil *et al.* (1995) recommended a spacing of 30 x 30 cm with bigger sized corm (above 4.1 cm diameter) for better flower and corm production. In Bangladesh, Mollah *et al.* (1995) suggested a spacing 15×15 cm and large cormel (7.0±0.2 g) for production of quality flowers and corm of gladiolus. It was found that spike length, floret number, flower diameter, size and weight of corms were increased. Though the research work is very old but plant spacing is important for better flower production. Now climatic conditions have been changed. Since the current information is meager regarding the proper spacing with present climatic context and the objective of the study is to investigate the proper plant spacing for better growth and flower production of gladiolus.

2. Materials and Methods

The present study was conducted at the Landscape Section, Bangladesh Agricultural University, Mymensingh during the period from October, 2015 to May, 2016 to investigate the effect of plant spacing on growth and flower production of gladiolus. The soil of the experimental site was a medium high land, silt loam and soil pH was 6.8. The land was well drained with good irrigation facilities. The recommend plant spacing and corm size of the experiment were S_1= 25×20 cm, S_2= 20×30 cm, S_3= 25×30 cm and C_1 = Small corm, 30±2 g, C_2 = Medium corm, 35±2 g, C_3 = Large corm >40g respectively. The experiment was laid out in Randomized Complete Block Design with three replications. Each block was divided into 9 plots where treatments were allotted at random. Thus, there were 27 (9x3) unit plots in the experiment. The size of a unit plot was 1 m x 1.2 m. The distance between the blocks was 50cm and between the adjacent plots was 25 cm. The different sizes corm of gladiolus viz. Small corm, (30±2 g), Medium corm, (35±2 g), Large corm, (>40g) were collected from Landscape Section, Bangladesh Agricultural University, Mymensingh and used in the present study. The parameter of the experiment were days required for 80% emergence, plant height, number of leaves per plant, days required for first spike initiation, Length of Spike at harvest, rachis length at harvest, number of florets per spike. The mean for all the treatments was calculated and the analysis of variance for each of the characters was performed by F test. The differences between the treatment means were evaluated by least significant difference (LSD) test at 1% or 5% probability wherever applicable (Gomez and Gomez, 1984).

3. Results and Discussion

3.1. Days required for 80% emergence of the crop

The effect of plant spacing and corm size was significant in respect of days required for 80% emergence of crop. The shortage time (11.00 days) was required in case of plant spacing 25×30 cm (S_3) with the largest corm size >40g (C_3). The longest time (22.00 days) was obtained from plant spacing 25×20 cm (S_1) with small corm size 30±2 g (C_1) (Table 1). Similar results were obtained by Kumar *et al.* (2016).

3.2. Number of leaves per plant

Different plants spacing and corm sizes on number of leaves per plant were statistically significant at 25, 40, 55 and 70 DAP (Table 1). It was found that maximum number of leaves (7.98) was produced in case of plant spacing 25×30 cm and large corm size >40g. The minimum number of leaves (6.35) was produced in case of plant spacing 25×20 cm with small corm size 30±2 g (Table 1). Leaves produced per plant were more in the plants grown with wither spacing with large corm size (Kumar *et al.*, 2016; Singh, 1998; Dilta *et al.*, 2000).

3.3. Plant height

The plant spacing and corm size on the plant height was found to be significant and highest at 70 DAP (74.61 cm) for the plant spacing 25 x 30 cm and corm size >40g, (S_3C_3). The lowest was found at 70 DAP (68.33 cm) with plant spacing 25×20 cm and small corm size (30±2) g (Figure 1). The plant synthesize more carbohydrates, hormones like GA_3 that enhanced longitudinal growth as internodes length and resulted in longer plants (Kumar *et al.*, 2016; Singh, 1998; Dilta *et al.*, 2000).

3.4. Days required for first spike initiation

The effect of plant spacing and corm size was found significant in respect of first spike initiation and their interaction effect was also found significant. The maximum time (98.33 days) was required in case of smallest corm size (30±2 g) combined with 25 x 20 cm, while it was minimum (70.33 days) in case of largest corm size (>40g) in combinations with largest spacing (25×30 cm) (Table 2). The fact was that in wider spacing the plant face lesser competition for water and mineral than the plant at closer spacing. (Mukhopadhyay and Yaday, 1984).

3.5. Length of spike at harvest

It was observed that the maximum spike length (70.00 cm) was produced by the plant spacing with large corms (>40g), while the minimum (53.50 cm) in case of plant spacing 25×20 cm and small corm size (30±2 g) (Table 2). Plant spacing and corm size on rachis length at harvest was statistically significant and their interaction effect was also significant. Uptake of moisture, nutrient and utilization of more sunlight allow the plant to grow more rapidly than closer spacing. These allowed the plant to synthesize more carbohydrates hormones like GA_3 that enhanced longitudinal growth as internodes length and resulted in longer spike. (Kumar *et al.*, 2016; Singh 1998; Dilta *et al.,* 2000).

3.6. Rachis length at harvest

Plant spacing and corm size on rachis length at harvest was statistically significant and their interaction effect was also significant. It was found that the highest rachis length (48.77 cm) was produced in case of the widest plant spacing 25×30 cm and the largest corm size (65±2 g) while the lowest (33.67 cm) was produced in case of plant spacing 25 x 20 cm with the smallest corm size (30±2 g) (Table 2). Similar result was found by Rabbani and Azad (1996).

3.7. Number of florets per spike and weight of spike

The plant spacing and corm size on number of florets per spike was significant. The widest spacing 25 x 30 cm and largest corm Size (>40g) produced maximum number (14.33) of florets per spike while it was minimum (8.50) with plant spacing 25 x 20 cm and small corm size (30±2 g) (Table 2). Similar findings were observed by Kumar *et al.,* (2016) and Dilta *et al.,* (2000).

The maximum weight of spike (35.60 g) was obtained by plant spacing 25×30 cm with the largest corm size (65±2 g), while minimum weight (20.60 g) was recorded in case of plant spacing 25×20 cm and small corm size (30±2 g) (Table 2). This could be due to higher amount of stored food reserves in large corms with wider plant spacing. (Mukhopadhyay and Yadav, 1984).

Table 1. The combined effect of 80% emergence, plant height and number of leaves at different days after planting of gladiolus.

Treatment combination	**Days required for 80% emergence**	**Number of leaves per plant at**			
		25DAP	**40DAP**	**55DAP**	**70DAP**
S_1C_1	22.00	2.17	3.81	5.10	6.35
S_1C_2	14.00	2.33	4.00	5.67	7.20
S_1C_3	13.00	2.67	4.33	6.00	7.67
S_2C_1	21.00	2.26	4.10	5.61	6.60
S_2C_2	14.00	2.51	4.53	5.89	7.41
S_2C_3	12.67	2.81	4.67	6.25	7.80
S_3C_1	20.00	2.50	4.30	6.14	7.00
S_3C_2	13.00	2.87	4.72	6.67	7.70
S_3C_3	11.00	3.25	5.06	7.00	7.98
$LSD_{0.05}$	0.44	0.09	0.14	0.07	0.10
$LSD_{0.01}$	0.61	0.13	0.20	0.10	0.15
Level of significance	**	**	**	**	**

******= Significant at 1% level of probability, ***** = Significant at 5% level of probability, NS = Not significant
S_1= 25×20 cm, S_2=20×30, S_3= 25×30
C_1 = Small corm, 30 ±2 g, C_2 = Medium corm, 35 ±2 g, C_3 = Large corm, >40g

Table 2. The combined effect of different plant spacing and corm size on plant growth, flowering, corm and cormel production of gladiolus.

Treatment combination	First spike initiation (day)	Length of spike at harvest (cm)	Rachis length at harvest (cm)	Number of florets per spike	Weight of spike (gm)
S_1C_1	98.33	53.50	33.67	8.50	20.60
S_1C_2	78.33	58.33	35.99	9.33	23.47
S_1C_3	76.33	60.47	37.33	10.14	26.60
S_2C_1	96.00	56.75	37.11	9.25	24.30
S_2C_2	77.67	62.47	40.66	10.70	25.70
S_2C_3	74.00	67.66	43.28	11.95	28.40
S_3C_1	93.33	59.71	41.88	10.87	26.20
S_3C_2	74.67	66.33	45.33	12.67	30.40
S_3C_3	70.33	70.00	48.77	14.33	35.60
$LSD_{0.05}$	0.420	0.410	0.197	0.182	0.232
$LSD_{0.01}$	0.579	0.564	0.272	0.250	0.320
Level of significance	**	**	**	**	**

**= Significant at 1% level of probability, * = Significant at 5% level of probability
S_1= 25×20 cm, S_2=20×30, S_3= 25×30
C_1 = Small corm 30 ±2 g, C_2 = Medium corm 35 ±2 g, C_3 = Large corm>40g

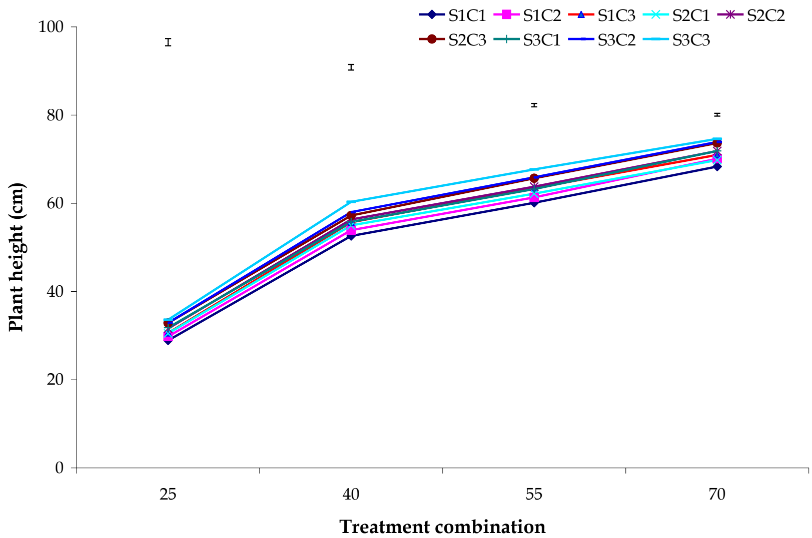

Figure 1. The combined effect of plant spacing and crom size on plant height of gladiolus at different days after planting. The veridical bars represent LSD 1% level of probability. Here, S_1= 25×20 cm, S_2= 20×30 cm, S_3= 25×30 cm. C_1= Small size, C_2=Medium size, C_3= Large size.

4. Conclusions

On above circumstances of the present study, it was observed that different plant spacing and corm size performed differently in respect of plant height, number of leaves per plant, days required for first spike initiation, length of spike, rachis length, number of florets, and weight of spike. From the combined study of this experiment, plant height (74.61 cm), number of leaves (7.98), length of spike (70.00 cm), rachis length (48.77 cm), number of florets per spike (14.33), weight of spike (35.60 g) were obtained from widest plant spacing 25×30 cm with large size corm (>40g). The second highest result obtained from plant spacing 25×30 cm with medium corm (35±2 g). Therefore, the results of the present study revealed that widest plant spacing 25×30 cm and large corm (>40g) was found to be the best for growth of spike production of gladiolus and it may be recommended for use at farmers level.

Conflict of interest

None to declare.

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