

Effect of Corm Size and Varieties on Growth Performance and Cut Flower Characteristics of Gladiolus

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ABSTRACT

An experiment was conducted to assess the effect of corm size and varieties on growth performance and cut flower characteristics of gladiolus in the farmer's field at Gunjanagar VDC, Chanauli, Chitwan during November 2008 to April 2009. The experiment consisted of 12 treatment combinations laid out in two-factorial Randomized Complete Block Design (RCBD) with three replications. Four sizes of corms viz. 2-3cm, 3-4cm, 4-5cm and 5-6cm and three varieties viz. American Beauty, Interpret and Yellow Summer Sunshine Growth performance and cut flower characteristics varied significantly among varieties and was affected by the size of corm. Large sized corms (5-6cm) performed better with respect to days to sprouting (16.11 days). Earlier spikes initiation (87.89 days), longer spikes (107.1cm) and more number of florets/spike (16.26) were produced from largest corms (5-6cm). Significant variation was observed among the varieties in most of the characters. Yellow Summer Sunshine sprouted earlier (16.08 days) while Interpret had earlier spike initiation (87.25 days). Plant height, leaf length and number of daughter corms were found highest in Yellow Summer Sunshine while maximum numbers of leaves per plant were found in American Beauty followed by Interpret. Regarding cut flower characteristics, Interpret was found superior having more number (16.12) of florets/spike.

Keywords: Gladiolus, sprouting, spike initiation and florets

INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.), Iridaceae family, is also known as “Queen of bulbous flowers”. It has been rated as one of the most popular flowers in the world (Makhijani, 1973) occupying fourth position after rose, chrysanthemum and carnation in international cut flower trade (Bose and Yadav, 1989). It is the first commercially grown cut flower crop and ranks number one in terms of production and consumption in Nepal (Pun, 2004). The daily demand of gladiolus is estimated to be 3,500-4,500 spikes in Kathmandu but the annual production is only around 800,000 spikes (Gauchan *et al.*, 2009). It is the largest grown cut flower in Nepal occupying the top position with 70% of all cut flower sales (Devtech, 1995).

Large numbers of cultivars have been developed every year, and hundreds of cultivars are being degenerated. (Deshraj and Misra, 1998). Characterization of these cultivars and identification of suitable cultivars, both for cut flower and corm/cormels production assumes significance for improving productivity and returns to the farmers. Chitwan district having 3.5 times more bulb output than hills of Kalimpong (India) has emerged as one of the most important district for growing gladiolus (FAN, 2007) during winter season when its production is impossible in open field in Kathmandu. Therefore, it is imperative to investigate the potentiality of various gladiolus varieties for growth as well as cut flower parameters so that cut flower enterprise can be further commercialized in Chitwan.

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Quantity as well as quality of flower spikes and daughter corms/cormels depends upon various factors, out of which size of mother corms play an important role (Sharma and Gupta, 2003). Size of planting material is important for obtaining good vegetative growth, quality spikes and corm production. Although, the works regarding influence of corm size in one variety are available but a thorough and comprehensive work taking different grades of corms and multiple varieties is not yet available in our context. In consideration of the above facts, the present study was undertaken to investigate the effect of corm size and varieties on growth performance and cut flower characteristics of gladiolus under Chitwan conditions.

MATERIALS AND METHODS

The experiment was conducted during November 2008 to April 2009 in a commercial gladiolus farm at Gunjanagar VDC, Chanauli, Chitwan. The experiment was laid out in a factorial RCBD with 12 treatments and 3 replications. Four size of corms (2-3cm, 3-4cm, 4-5cm and 5-6cm) and three commercial varieties (American Beauty, Interpret, and Yellow Summer Sunshine) were used as two different factors. The total experimental area was 196.65 m² (17.1m × 11.5m) with an individual plot size of 2.1m x 1m i.e. 2.1 m² where four sized corms were planted in the furrows at the crop geometry of 30cm x 25cm. Well decomposed farmyard manure (FYM) was applied @ of 20 t/ha, 2 weeks before planting. Half dose of nitrogen, full doses of phosphorous and potash @ 150: 100: 100 kg NPK/ha were incorporated into the soil at the time of planting. Half dose of nitrogen, full doses of phosphorous and potash were incorporated into the soil at the time of corm planting. The remaining amount of nitrogen was splitted into two equal parts and each part was top-dressed at 45 and 75 days after planting. Observations on days to sprouting, number of leaves/plant, plant height, length of leaves, days to spike initiation, length of spike and rachis and numbers of florets/spike were recorded. Analysis of variance for all parameters was done using statistical analysis through MSTAT-C programme. All the analyzed data were subjected to DMRT for mean separation at 5% level of significance.

RESULTS AND DISCUSSION

Morphological parameters

Days to sprouting

Days to sprouting varied significantly among the different sizes of corms (Table 1). Bigger sized corms sprouted earlier than the smaller sized corms. Corm size 5-6cm recorded the earliest days to sprouting (16.11 days) which was at par with days taken by 4-5cm (16.78 days) and smallest sized corms (2-3cm) took the maximum days (18.33 days) to sprouting. The earlier sprouting of larger corms might be due to the higher amount of stored reducing sugars and endogenous gibberellin in the large sized corms as compared to smaller ones. Misra and Singh (1989) have reported positive correlation of reducing sugars with sprouting percentage. Similarly, highly significant differences among the tested varieties were found on days to spouting (Table 1). Yellow Summer Sunshine sprouted earlier (16.08 days) followed by Interpret (17.17 days) whereas it was delayed in American Beauty (18.33 days). The variation on days to sprouting was expected to occur as it is controlled by genetic composition of variety as was also suggested by Kamble *et al.*, 2004.

Number of leaves/plant

Highly significant variation was found among the different sized corms on number of leaves/plant (Table 1). Largest corms (5-6cm) produced the plants with maximum leaves/plant (9.54) followed by second largest (4-5cm) while smallest (2-3cm) produced the plants with least number of leaves/plant (8.63). The increased number of leaves per plant from large sized corms might be due to the higher stored food reserves (Sharma and Gupta, 2003). On the other hand, highest number of leaves/plant was recorded in American Beauty (9.66) followed by Yellow Summer Sunshine (8.94) and least number were found in Interpret (8.65).

Table 1: Effect of corm size and varieties on morphological characteristics of gladiolus grown under Chitwan condition (2008/2009).

Treatments	Days to sprouting	No. of leaves/plant	Plant height	Leaf length	Days to spike initiation
Corm size (Fa)					
2-3cm	18.33 ^a	8.63 ^d	51.50 ^d	41.06 ^c	97.00a
3-4cm	17.56 ^{ab}	8.97 ^c	57.81 ^c	45.76 ^b	96.00a
4-5cm	16.78 ^{bc}	9.20 ^b	60.94 ^b	47.56 ^{ab}	91.89b
5-6cm	16.11 ^c	9.54 ^a	63.73 ^a	50.18 ^a	87.89c
SEM±	0.41	0.06	0.81	1.16	1.18
LSD _{0.05}	1.20**	0.19**	2.38**	3.41**	3.46**
Varieties (Fb)					
American Beauty	18.33 ^a	9.66 ^a	53.72 ^b	44.56 ^b	93.75b
Interpret	17.17 ^b	8.65 ^c	48.46 ^c	38.40 ^c	87.25c
Yellow Summer Sunshine	16.08 ^c	8.94 ^b	73.30 ^a	55.46 ^a	98.58a
SEM±	0.36	0.05	0.70	1.01	1.02
LSD _{0.05}	1.04**	0.17**	2.06**	2.96**	3.00**
CV%	7.19	2.21	4.06	7.58	3.80

Figures followed by same letters within the column are not significant (P<0.05) by DMRT

Plant height

The analysis of variance showed highly significant effect of corm size on plant height (Table 1). Plants from largest corms (5-6cm) were tallest (63.73cm) followed by plants from 4-5cm sized corms while the smallest sized corms (2-3cm) produced the plants with the smallest height (51.50cm). A similar trend in plant height grown from larger corm was reported by Mohanty *et al.* (1994); De and Dhiman (2003); Baweza (2003); Pillewan *et al.* (2004); Pandey and Mishra (2005) and Kumar and Yadav (2006). Among three varieties, highest plant height was found in Yellow Summer Sunshine (73.30cm) followed by American Beauty (53.72cm) and lowest plant height was found in Interpret (48.46cm).

Leaf length

The effect of corm size on leaf length was found highly significant (Table 1). Longest leaves (50.16cm) were found on plants from the largest corms (5-6cm) which was at par with the leaf length (47.56cm) of plants from 4-5cm sized corms while the smallest sized corms (2-3cm) produced the plants with minimum length of leaves (41.06cm). Higher leaf length from larger corms has also been reported by Laskar and Jana (1994); Pandey and Mishra (2005); Kumar and Yadav (2006) and Joshi (2008). Among three varieties, the longest leaves (55.46cm) were found in yellow summer sunshine followed by American beauty (44.56cm) while the smallest leaves were found in Interpret (38.40cm).

Phenological parameters

Days to spike initiation

Analysis of variance for days to spike initiation showed highly significant differences among different sized corms (Table 1). The plants from 5-6cm sized corms were the earlier (88 days) to spike initiation followed by plants from 4-5cm (92 days) whereas it was delayed (97.00 days) in plants from the smallest sized corms (2-3cm) which was statistically at par with days taken (96.00 days) by plants from 3-4cm sized corms. Among varieties, highly significant variation was found on days to spike initiation. Interpret was found early (87.25 days) while Yellow Summer Sunshine was late in (98.58 days).

Length of spike

The effect of corm size on spike length was found highly significant (Table 2). Large sized corms (5-6cm) produced the longest spike (107.1cm) which was at par with the spike length (100.5cm) produced by medium ones (4-5cm) and the shortest spikes (90.52cm) were produced by the smallest sized corms (2-3cm). The longer spikes from bigger sized corms might be due to the high amount of carbohydrates and gibberellin in larger corms which might have helped in better vigour of plants having more plant height, leaf length and breadth which ultimately helped in having superior spikes (Ara *et al.*, 2000). A similar result was reported by Joshi (2008) when large sized corms (3.75cm to 4.5cm) were planted as mother corms in gladiolus cv. American Beauty. The tested varieties differed significantly with respect to spike length having values 84.10cm to 115.9cm (Table 2). Yellow Summer Sunshine recorded the longest spikes (115.9cm) followed by American Beauty (95.21cm) and lowest spike length was recorded in Interpret (84.10cm). The variation in spike length might be due to the genetic makeup of the varieties. .

Table 2: Effect of corm size and varieties on spike characteristics of gladiolus grown under Chitwan condition (2008/2009).

Treatments	Spike length (cm)	Rachis length (cm)	No. of florets spike	No. of daughter corms	Weight of daughter corms	No. of cormels/plant
Corm size (Fa)						
2-3cm	90.52 ^c	39.89 ^d	13.73 ^d	1.33 ^c	43.44 ^d	41.03 ^d
3-4cm	95.52 ^{b^c}	41.69 ^c	14.76 ^c	1.63 ^b	54.02 ^c	51.02 ^c
4-5cm	100.5 ^{ab}	43.77 ^b	15.66 ^b	1.75 ^{ab}	63.20 ^b	64.67 ^b
5-6cm	107.1 ^a	46.38 ^a	16.26 ^a	1.87 ^a	74.70 ^a	78.74 ^a
SEM±	2.73	0.51	0.19	0.05	2.39	3.09
LSD _{0.05}	8.00**	1.50**	0.57**	0.15**	7.02**	9.06**
Varieties (Fb)						
American Beauty	95.21 ^b	46.01 ^a	15.57 ^b	1.25 ^c	46.62 ^c	34.59 ^b
Interpret	84.10 ^c	40.90 ^b	16.12 ^a	1.41 ^b	57.00 ^b	101.2 ^a
Yellow Summer Sunshine	115.9 ^a	41.89 ^b	13.62 ^c	2.27 ^a	72.90 ^a	40.82 ^b
SEM±	2.36	0.44	0.17	0.04	2.07	2.67
LSD _{0.05}	6.93**	1.30**	0.49**	0.13**	6.08**	7.85**
CV%	8.32	3.58	3.88	9.56	12.21	15.75

Figures followed by same letters within the column are not significant (P<0.05) by DMRT

Length of rachis

The effect of varieties and corm size on rachis length was found highly significant (Table 2). The large sized corms (5-6cm) produced the longest rachis (46.38cm) whereas the smallest corms (2-3cm) produced the shortest ones (39.89cm). The differences in rachis length depend on various factors like length of spike, number of florets/spike, internodal distance between florets and also the amount of carbohydrate present in mother corms and its subsequent effect on further performance. This finding is in conformity with that of Wilfert (1980); Ara *et al.* (2000) and Joshi (2008).. American Beauty produced the longest rachis (46.01cm) while shortest rachis (40.90cm) was noticed in Interpret which was statistically at par with rachis length of Yellow Summer Sunshine (41.89cm).

Number of florets per spike

Highly significant variation on number of florets/spike was recorded among the different sized corms planted (Table 2). The corm size 5-6cm yielded the spike with maximum number of florets (16.26) while the smallest sized corms (2-3cm) yielded the spike with the lowest number of florets (13.73). Highly significant variations were recorded among the tested varieties on number of florets per spike (Table 2). Interpret yielded the spike with maximum number of florets (16.12) followed by American beauty (15.57) and the lowest number of florets per spike (13.62) were recorded in Yellow Summer Sunshine. Short florets, close internodal distance in Interpret variety as compared to other two varieties could be the genetic character of the variety. Varietal variation in number of florets/spike was also reported by Sindhu and Verma (1995); Regmi (2000) and Poon (2009).

CONCLUSION

The size of the corm affected the growth and cut flower attributes of gladiolus. Large sized corms (5-6cm) performed significantly better as compared to small sized in all aspects. Among the three varieties, Yellow Summer Sunshine was found early in sprouting of corms while Interpret was found early in spike initiation. While cut flower characteristics were found better in Interpret.

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