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RESPONSE OF GLADIOLUS VAR. "AMERICAN BEAUTY" TO SPACING AND CORM SIZE

M. H. Bhande, Neha Chopde, Parinita Wasnik and V. P. Warkade

Horticulture Section, College of Agriculture, Amravati Road, Nagpur – 440 010 (Maharashtra), India.

Abstract

A field experiment on 'Response of gladiolus var. American Beauty to spacing and corm size' was carried out during *rabi* season of the year 2014-15 at Satpuda Botanic Garden, College of Agriculture, Nagpur (Maharashtra), India; with nine treatment combinations in Factorial Randomized Block Design. The treatments comprised of three levels of spacing *viz*. 45 × 15 cm, 30 × 30 cm and 30 × 20 cm and three corm sizes *viz*. large (21-30 g), medium (11-20 g) and small (01-10 g). The results indicated that widest spacing and largest sized corms recorded significantly maximum leaf area, spike diameter, longevity of spike, diameter of corm, weight of corms and cormels plant^{-1}, corm and cormel yield and earliest 50 per cent flowering as compared to the treatments. However, interaction effect of spacing and corm size on growth, flowering, yield and quality parameters of gladiolus was found to be non-significant except corm yield plant^{-1} and ha^{-1}. Significantly the highest corm yield was noted with the large sized corms of gladiolus planted at wider spacing.

Key words : Gladiolus, spacing, corm size, spike.

Introduction

Gladiolus, botanically known as *Gladiolus grandiflorus* L., is a herbaceous, perennial, flowering bulbous plant belonging to the family *Iridaceae.* It has second rank after tulip among the bulbous flowers in India and has occupied fourth position in international trade of cut flowers. Gladiolus is the most attractive group among the flower crops. Flowers enhance the quality of fresh air, fragrance to breath and also provide colour touch to life. It's fascinating spikes bear a large number of florets in varying sizes and forms with smooth ruffles of deeply crinkled sepals. Popularity of this crop as a cut flower is increasing day by day because of its keeping quality and in-exhaustive range of colors of the spikes. Production of quality gladiolus spikes is still a problem in many countries as the commercial cultivation aimed at export standard spikes and it is governed by the quality of propagation materials ie. corms and cormels. One mother corm generally produces a spike or two with one or two daughter corms of standard size and few cormels. However, the cormels require two to three seasons to produce standard flower spike and daughter corm. To achieve production of quality spikes and corms improved crop management techniques need to be standardized for every new location where the crop is grown. Besides the climatic conditions, the plant spacing plays an important role in production of higher yield of better quality spikes and corms of gladiolus. The basic crop management practices like plant spacing and corm size are needed to be standardized for cultivating this crop on commercial scale under Nagpur conditions. Hence, the present investigation was undertaken to study the response of gladiolus var. 'American Beauty' to spacing and corm size

Materials and Methods

The investigation was carried out at Satpuda Botanic Garden, College of Agriculture, Nagpur during *rabi* season of the year 2014-15 to study the effect of spacing and corm size on growth, yield and quality of gladiolus and find out suitable combinations of spacing and corm size for production of higher yield of better quality spikes and corms of gladiolus with nine treatment combinations in Factorial Randomized Block Design with three replications. The treatments comprised of three different spacing *viz*. 45 × 15 cm (S_1), 30 × 30 cm (S_2) and 30 × 20 cm (S_3) and three corm sizes (according to weight of corm) *viz*. C_1 - large (21-30 g), C_2 - medium (11-20 g) and C_3 - small (01-10 g).

After preparatory tillage operations, well-rotted FYM

@ 20 t ha^{-1} was mixed uniformly in the soil before last harrowing. The field was laid out with the beds of ridges and furrows as per the different treatments of spacing and the beds were prepared. The rested, cold stored and uniform sized gladiolus corms of the variety 'American Beauty' were separated as large, medium and small as per the treatments and treated with copper fungicide for 15 minutes before planting. The corms were planted at different spacing on ridges and furrows at 5 cm depth. The various observations on growth, flowering, yield and quality parameters of gladiolus spikes and corms were recorded and analysed statistically.

Results and Discussion

The data presented in tables 1 and 2 revealed that different levels of spacing and corm size had significant effect on all growth, flowering, quality parameters and corm yield of gladiolus.

Growth

It is observed from table 1 that significantly maximum leaf area in gladiolus was recorded with the spacing S_1- 45 × 15 cm (120.42 cm^2) as compared to other treatments, whereas, the closer spacing of 30x20 cm noted minimum leaf area (110.54 cm^2). Similarly, largest corm (C_1) exhibited significantly the highest leaf area (118.11 cm^2) and it was statistically at par with the medium sized corms *i.e.* C_2 (116.55 cm^2). However, the small sized corms (C_3) noted minimum vegetative growth in terms of leaf area (111.85 cm^2). The interaction effect of spacing and corm size in respect of leaf area was found non-significant.

The wider spacing and large sized corms of gladiolus recorded maximum vegetative growth in respect of leaf area. This might have been due to more space and sun light available under wider spacing that ultimately would have helped in larger biosynthesis of photoassymilates and maximum reserved food available in the large sized corms. These findings confirm the results of Sudhakar and Kumar (2012) in gladiolus who reported maximum vegetative growth of gladiolus due to widest spacing and largest corms as compared to other treatment combinations.

Flowering

Significantly the earliest 50 per cent flowering was found with the wider spacing (S_1) of 45 × 15 cm (87.20 days) and it was statistically at par with 30 × 30 cm *i.e.* S_2 (90.44 days), whereas, the plants under closer spacing (S_1) of 30 × 20 cm recorded late 50 per cent flowering (93.82 days). In respect of corm size, the largest corms (C_1) noted earlier 50 per cent flowering (87.88 days) which was at par with medium sized corms *i.e.* C_2 (89.95 days), however, small size corms *i.e.* C_3 required maximum days (93.63 days) for 50 per cent flowering in gladiolus. Interaction effect of spacing and corm size in respect of 50 per cent flowering in gladiolus was found non-significant.

An early flowering with the spacing of 45 × 15 cm and large corm size might be due to enhanced growth and development of plant. Wider spacing and large sized corms of gladiolus enhanced photosynthesis due to availability of more space and sunlight and more reserved food material, respectively. This may be the attributing factor for the positive effectiveness of wider spacing and large sized corms on reducing juvenile phase of the plant. The results could paint in the the same direction of Singh and Singh (2004), Shiraz and Maurya (2005) and Bhat *et al.* (2009) in gladiolus.

Quality

The flower quality attributes like spike diameter and longevity of spike, the wider spacing 45 × 15 cm (S_1) exhibited significantly maximum values (0.65 cm and 7.58 days, respectively) which was statistically at par with S_2 *i.e.* 30 × 30 cm spacing (0.62 cm and 7.28 days, respectively), however, the closer spacing 30 × 20 cm (S_3) recorded minimum values (3.00 cm and 6.95 days, respectively).

The large sized corms (C_1) produced gladiolus spikes with significantly maximum diameter (4.61 cm) and longevity of spike (7.92 days) as compared to medium (C_2) and small sized corms (C_3).

Similarly, diameter of corm, weight of corms $plant^{-1}$ and weight of cormels $plant^{-1}$ were recorded significantly maximum with the wider spacing *i.e.* S_1 (4.77 cm, 78.13 g and 13.22 g, respectively), whereas, the closer spacing (S_3) noted significantly minimum values (3.00 cm, 60.26 g and 8.10 g, respectively). However, in respect of corm size, the larger corms (C_1) produced maximum diameter of corm (4.61 cm), weight of corms $plant^{-1}$ (73.35 g) and weight of cormels $plant^{-1}$ (11.25 g), whereas, minimum values (3.40 cm, 61.93 g and 9.05 g, respectively) were recorded with small sized corms (C_3). The interaction effect of spacing and corm size on quality parameters of gladiolus spike and corm was found non-significant.

This might be due to increased availability of photosynthates as a result of enhanced growth rate of vegetative plant parts under the treatments of wider spacing and large sized corms which resulted into production of more food material which in turn might have been utilized for better development of spikes and corms of gladiolus. These results are in accordance with those obtained by Sharma and Gupta (2003) in gladiolus.

Table 1 : Effect of spacing and corm size on growth, flowering, yield and quality attributes of gladiolus.

Treatments	Leaf area (cm^2)	Days to 50% flowering (days)	Spike diameter (cm)	Diameter of corm (cm)	Longevity of spike (days)	Weight of corms $plant^{-1}$ (g)	Weight of cormels $plant^{-1}$ (g)	Cormels $plant^{-1}$	Cormels ha^{-1} (lakh)
Factor A – Spacing									
S_1 – 45 × 15 cm	120.42	87.20	0.65	4.77	7.58	78.13	13.22	35.25	33.29
S_2 – 30 × 30 cm	115.56	90.44	0.62	3.89	7.28	63.50	8.99	26.75	22.83
S_3 – 30 × 20 cm	110.54	93.82	0.58	3.00	6.95	60.26	8.10	19.60	18.95
F test	**SIG**	**SIG**	**SIG**	**SIG**	**SIG**	**SIG.**	**SIG**	**SIG**	**SIG**
SE (m) ±	1.58	1.51	0.01	0.13	0.13	1.16	0.33	0.85	0.75
CD at 5%	4.74	4.52	0.03	0.40	0.38	3.49	1.00	2.56	2.24
Factor B – Corm size									
C_1 – Large (21-30 g)	118.11	87.88	0.65	4.61	7.92	73.35	11.25	30.19	27.07
C_2 – Medium (11-20 g)	116.55	89.95	0.61	3.58	7.16	66.61	10.00	26.91	24.12
C_3 – Small (1-10 g)	111.85	93.63	0.59	3.40	6.73	61.93	9.05	24.50	21.87
F test	**SIG**	**SIG**	**SIG**	**SIG**	**SIG**	**SIG**	**SIG**	**SIG**	**SIG**
SE (m) ±	1.58	1.51	0.01	0.13	0.13	1.16	0.33	0.85	0.75
CD at 5%	4.74	4.52	0.03	0.40	0.38	3.49	1.00	2.56	2.24
Interaction effect (S × C)									
F test	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**
SE (m) ±	2.74	2.61	0.02	0.23	0.22	2.02	0.56	1.48	1.29
CD at 5%		-	-	-	-	-	-	-	-

Table 2 : Corm yield of gladiolus as influenced by spacing and corm size.

Spacing	Corms $plant^{-1}$				Corms ha^{-1}			
	Corm size				Corm size			
	C_1 – Large (21-30 g)	C_2 – Medium (11-20 g)	C_3 – Small (1-10 g)	Mean	C_1 – Large (30-40 g)	C_2 – Medium (20-30 g)	C_3 – Small (10-20 g)	Mean
S_1 – 45 × 15 cm	4.64	4.12	3.47	4.08	4.39	3.89	3.27	3.85
S_2 – 30 × 30 cm	3.55	3.53	3.27	3.45	3.26	3.01	2.55	2.94
S_3 – 30 × 20 cm	3.07	2.83	2.40	2.77	2.51	2.50	2.32	2.44
Mean	3.75	3.49	3.05		3.39	3.13	2.72	
	F-test	**SE (m) ±**	**CD at 5%**		**F-test**	**SE (m) ±**	**CD at 5%**	
Spacing(S)	**SIG.**	0.08	0.23		**SIG.**	0.07	0.20	
Corm size(C)	**SIG.**	0.08	0.23		**SIG.**	0.07	0.20	
Interaction (S × C)	**SIG.**	0.13	0.39		**SIG.**	0.12	0.35	

They revealed that, increasing size of mother corms of gladiolus planted at wider spacing produced better quality spikes and corms.

Corm and cormel yield

It is clear from the data presented in tables 1 and 2 that, significantly maximum number of gladiolus corms and cormels $plant^{-1}$ (4.08 and 35.22, respectively) and ha^{-1} (3.85 and 33.29 lakh, respectively) were produced with the treatment of wider spacing S_1 (45 × 15 cm), which was closely followed by the treatment of 30 × 30 cm (S_2), whereas, closer spacing *i.e.* S_3 (30 × 20 cm) counted minimum number of corms and cormels $plant^{-1}$ (2.77 and 19.60, respectively) and ha^{-1} (2.44 and 18.95 lakh, respectively). In respect of corm size, the large sized corms *i.e.* C_1 produced significantly maximum corms and cormels $plant^{-1}$ (3.75 and 30.19, respectively) and ha^{-1} (3.39 and 27.07 lakh, respectively) which was closely followed by the medium sized corms *i.e.* C_2, however, the least number of corms and cormels $plant^{-1}$ (3.05 and 24.50, respectively) and ha^{-1} (2.72 and 21.87 lakh, respectively) were counted with the smaller sized corms (C_3) of gladiolus. The interaction effect of spacing and

corm size on cormels plant^{-1} and ha^{-1} in gladiolus was non - significant.

However, the interaction effect of spacing and corm size on corms plant^{-1} and ha^{-1} in gladiolus was found significant (table 2). The treatment combination of S_1C_1 *i.e.* large sized corms planted at wider (45 × 15 cm) spacing counted significantly highest number of corms plant^{-1} and ha^{-1} (4.64 and 4.39 lakh, respectively) and it was closely followed by the treatment combination of S_1C_2 *i.e.* medium sized corms planted at wider spacing (4.12 and 3.89 lakh, respectively), whereas, the least number of corms plant^{-1} and ha^{-1} (2.40 and 2.32 lakh, respectively) were counted with the treatment combination of S_3C_3 *i.e.* small sized corms planted at closer spacing of 30 × 20 cm. An increase in the yield of gladiolus corms might be due to the fact that, the plants produced from large sized corms planted at wider spacing might have been resulted into production and accumulation of more photosynthates which might have been translocated towards underground part of the plant and utilized for better development of corms resulted into maximum corm yield in gladiolus. These results are in close conformity with the results of Kamal Narayan *et. al.* (2013) in gladiolus who reported that, large sized corms planted at wider spacing recorded the highest yield of gladiolus corms and cormels.

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