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EFFECT OF SPACING AND CORM SIZE ON GROWTH, YIELD AND QUALITY OF GLADIOLUS

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Abstract

The investigation entitled "Effect of spacing and corm size on growth, yield and quality of gladiolus" 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*. small (01-10 g), medium (11-20 g) and large (21-30 g). The results revealed that wider spacing and large sized corms recorded significantly maximum vegetative growth in respect of plant height and leaves plant^{-1}, number of spikes plant^{-1}, quality parameters *viz*. length of spike, length of rachis, florets spike^{-1} and vase life of flower and minimum days for first spike emergence and opening of first floret. However, interaction effect of spacing and corm size on growth, flowering, yield and quality parameters of gladiolus was found to be non-significant except days for sprouting of corms and spikes plant^{-1}. Significantly earliest sprouting was noted with the large sized corms planted at closer spacing, however, the highest number of spikes plant $^{-1}$ were counted with the large sized corms planted at wider spacing.

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

Introduction

Gladiolus (*Gladiolus grandiflorus* L.), belonging to family *Iridaceae,* is one of the most popular ornamental bulbous flower crops grown commercially for its bewitching flowers. It has second rank after tulip among the bulbous flowers in India and has occupied fourth position in international trade of cut flowers. 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 *i.e.* corms and cormels. One mother corm generally produces a spike with one daughter corm of standard size and few cormels. However, the cormels require two to three seasons to produce standard flower spike and daughter corm. The cormel is an auxiliary bud on the corm which is a compressed thickened stem and as the resting perpetuating organ. To achieve production of quality spikes 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 effect of spacing and corm size on growth, flowering, yield and quality of gladiolus cv. American Beauty.

Materials and Methods

The investigation was carried out at Satpuda Botanic Garden, College of Agriculture, Nagpur (Maharashtra), India 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 - small (01-10 g), C_2 - medium (11-20 g) and C_1 - large (21-30 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, yield and quality parameters of gladiolus studied in this experiment except days for first spike emergence which was influenced non-significantly by different spacing treatments.

Growth

Significantly the earliest sprouting of corms was found with the closer spacing (S_3) of 30 × 20 cm (5.06 days) and it was statistically at par with 30 × 30 cm *i.e.* S_2 (5.16 days), whereas, the corms under wider spacing (S_1) of 45 × 15 cm sprouted late (5.58 days). In respect of corm size, the largest corms (C_1) sprouted earlier (4.54 days) as compared to medium *i.e.* C_2 (5.01 days) and small size corms *i.e.* C_3 (6.26 days). Interaction effect of spacing and corm size in respect of days for sprouting was found significant. The treatment combination of S_3C_1 *i.e.* large size corms planted at closer spacing recorded significantly earliest sprouting of gladiolus corms (3.93 days), whereas, S_3C_3 *i.e.* small size corm planted at closer spacing noted latest sprouting of corms (6.60 days). Significantly maximum plant height and leaves $plant^{-1}$ in gladiolus were recorded with the spacing S_1-45 × 15 cm (58.72 cm and 16.03, respectively) which was found to be at par with S_2 -30 × 30 cm spacing in respect of leaves $plant^{-1}$ (15.53). Similarly, largest corm (C_1) exhibited significantly the highest plant height (60.32 cm) and leaves $plant^{-1}$ (17.87) followed by medium sized corms *i.e.* C_2 (56.01 cm and 15.46, respectively). Whereas, the small sized corms (C_3) noted minimum vegetative growth in terms of plant height (53.68 cm) and leaves $plant^{-1}$ (13.33). However, the interaction effect of spacing and corm size in respect of plant height and leaves $plant^{-1}$ was found non-significant.

The wider spacing and large sized corms of gladiolus recorded maximum vegetative growth in respect of plant height and leaves $plant^{-1}$. This might have been due to more space and sun light available under wider spacing and maximum reserved food in the big sized corms. These findings confirm the results of Farid Uddin *et al*. (2002) and Sharma and Gupta (2003) in gladiolus.

Flowering

The treatment of wider spacing *i.e.* S_1 took significantly minimum days for opening of first floret (71.61 days), whereas, the closer spacing *i.e.* S_3 recorded maximum days for opening of first floret in gladiolus (74.81 days) which was found statistically at par with the spacing of 30 × 30 cm *i.e.* S_2 (74.75 days).

In respect of corm size, the large sized corms recorded earliest first spike emergence (61.39 days) as well as opening of first floret (67.55 days), whereas, the small sized corms took maximum days for first spike emergence (67.22 days) and opening of first floret (76.43 days) which was statistically at par with medium sized corms (67.13 and 74.18 days, respectively).

An early flowering with the spacing of 45 x 15 cm and large corm size might be due to enhanced growth and development of plant. The results could paint in the results of Sing and Singh (2004), Shiraz and Maurya (2005) and Bhat *et al.* (2009) in gladiolus.

Flower quality

The flower quality parameters like rachis length, spike length, florets $spike^{-1}$ and vase life of flower, the wider spacing 45 × 15 cm (S_1) exhibited significantly maximum values (31.11 cm, 87.33 cm, 8.24 and 7.48 days, respectively) which was statistically at par with S_2 *i.e.* 30 × 30 cm spacing in respect of rachis length (29.92 cm) and vase life of flower (7.22 days), however, the closer spacing 30 × 20 cm (S_3) recorded minimum values (28.77 cm, 82.55 cm, 7.46 and 6.94 days, respectively).

In respect of corm size, the large sized corms ($C_{1)}$ produced gladiolus spikes with significantly maximum rachis length (32.72 cm), spike length (89.15 cm), florets $spike^{-1}$ (9.35) and vase life of flower (7.90 days) as compared to medium ($C_{2)}$ and small sized corms (C_3).

This might be due to increased availability of photosynthates due to enhanced growth rate of vegetative plant parts under the treatments of wider spacing and large sized corms which might have been utilized for the production of better quality spikes in respect of length of spike and rachis and increased their turgidity. These results are in accordance with those obtained by Sharma and Gupta (2003) in gladiolus. They revealed that, increasing size of mother corms of gladiolus planted at

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

Treatments	Plant height (cm)	Leaves plant^{-1}	Days for 1st spike emergence	Days for opening of 1st floret	Rachis length (cm)	Spike length (cm)	Florets spike^{-1}	Vase life of flower (days)
Spacing (S)								
S_1	58.72	16.03	64.24	71.61	31.11	87.33	8.24	7.48
S_2	56.03	15.53	65.55	74.75	29.92	84.44	7.55	7.22
S_3	55.26	15.11	65.94	74.81	28.77	82.55	7.46	6.94
F test	**Sig.**	**Sig.**	**N.S.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**
S.Em.±	0.48	0.24	0.63	0.92	0.60	0.60	0.15	0.12
CD at 5%	1.43	0.72	-	2.78	1.80	1.81	0.47	0.37
Corm size (C)								
C_1	60.32	17.87	61.39	67.55	32.72	89.15	9.35	7.90
C_2	56.01	15.46	67.13	74.18	28.91	83.06	7.27	7.07
C_3	53.68	13.33	67.22	76.43	28.17	82.11	6.63	6.67
F test	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**	**Sig.**
S.Em.±	0.48	0.24	0.63	0.92	0.60	0.60	0.15	0.12
CD at 5%	1.43	0.72	1.90	2.78	1.80	1.81	0.47	0.37
Interaction effect (S × C)								
F test	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**
S.Em.±	0.83	0.41	1.09	1.60	1.03	1.04	0.96	0.21
CD at 5%	-	-	-	-	-	-	-	-

Table 2 : Effect of spacing and corm size on days for sprouting of corms and spikes plant^{-1} in gladiolus.

Spacing	Days for sprouting of corms				Spikes plant^{-1}			
	Corm size				Corm size			
	C_1	C_2	C_3	Mean	C_1	C_2	C_3	Mean
S_1	5.06	5.43	6.26	5.58	4.00	3.73	2.60	3.33
S_2	4.63	4.93	5.93	5.16	3.30	3.17	2.60	3.12
S_3	3.93	4.66	6.60	5.06	2.70	2.47	2.50	2.56
Mean	4.54	5.01	6.26		3.44	3.02	2.55	
	F-test	**S.Em.±**	**CD at 5%**		**F-test**	**S.Em.±**	**CD at 5%**	
Spacing(S)	**Sig.**	0.13	0.39		**Sig.**	0.07	0.22	
Corm size(C)	**Sig.**	0.13	0.39		**Sig.**	0.07	0.22	
Interaction (SxC)	**Sig.**	0.22	0.66		**Sig.**	0.13	0.38	

wider spacing reduced time required for flower emergence.

Flower yield

In this experiment, total number of gladiolus spikes plant^{-1} was produced significantly maximum (3.33) with wider spacing S_1 (45 × 15 cm) which was statistically at par with the spacing of 30 × 30 cm *i.e.* S_2 (3.12), whereas, closer spacing *i.e.* S_3 (30 × 20 cm) counted minimum number of spikes plant^{-1} (2.56). Similarly, the large sized corms *i.e.* C_1 produced significantly maximum spikes plant^{-1} (3.44) which was closely followed by the medium sized corms *i.e.* C_2 (3.02), however, the least number of spikes plant^{-1} (2.55) were counted with the smaller sized corms (C_3) of gladiolus.

The interaction effect of spacing and corm size on spikes plant^{-1} in gladiolus was found significant. The treatment combination of S_1C_1 *i.e.* large sized corms planted at wider (45 × 15 cm) spacing counted significantly highest number of spikes plant^{-1} (4.00) and it was statistically at par with the treatment combination of S_1C_2 *i. e.* medium sized corms planted at wider spacing (3.73), whereas, the least number of spikes were counted with the treatment combination of S_3C_3 *i.e.* smaller sized corms planted at closer spacing of 30 × 20 cm (2.50). An

increase in the yield of gladiolus spikes 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 would have diverted to the sink resulted into maximum spike 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 maximum yield of gladiolus spikes and corms.

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