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Suitability of cut corms as planting material on flowering, corm and cormel production in gladiolus (*Gladiolus grandiflorus* L.) varieties

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ABSTRACT : The present investigation entitled, "Suitability of cut corms as planting material on flowering, corm and cormel production in gladiolus (*Gladiolus grandiflorus* L.) Varieties" was under taken in the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad during Rabi season (2016-2017). The experiment was layout in Factorial Randomized Block Design (FRBD) with 12 treatments and each treatment replicated thrice. The treatments consist of different division of corms (Full, Half and one- third) and 4 varieties (Deepest Red, Jessica, Amsterdam and Esta Bonita). Early spike emergence (55.27) was found when full corm was planted for Jessica Variety whereas spike length was maximum (94.00cm) in variety Esta Bonita. Regarding number of florets per spike (14.83), number of daughter corms (65.16) per plant were found to be best in variety Amsterdam when full corms were planted whereas number of cormels (59.57) were found to be maximum in variety Deepest Red.

Key Words: Gladiolus (*Gladiolus grandiflorus*), cut corms, florets, daughter corms, cormels production.

Gladiolus is a popular flowering plant grown all over the world, from South Africa to West Asia. The term gladiolus was coined by Pliny the Elder *(A.D-23-79)* deriving from the Latin word "Gladius", because of its sword-like leaves. It is popularly known as sword lily. The modern hybrids are botanically known as *Gladiolus grandiflorus* belonging to family Iridaceae bearing chromosome number 60. It is also known as "Queen of Bulbous Crops". Unlike other export oriented cut flower it can be raised under open field conditions and still produces exportable quality spikes. It is easy to grow and is commonly grown for garden use and for cut flower (Aswath and Parathasarathy, 1996). In the international cut-flower trade gladiolus occupies fourth place (Bhattacharjee and De, 2010). Gladiolus is grown commercially from corms both for the flowering spikes and for corm production and it is principally propagated by natural multiplication of new corms and cormels (Memon *et al*., 2009; Hartmann *et al*., 1997; Ziy and Lilien-kipnis, 1990). However, owing to their low rate of multiplication and to a high percentage of spoilage of corms during storage, there is an insufficient supply of planting material (Memon *et al*., 2012; Singh and Dohare, 1994). In such a case, propagation may be done by cutting the corms into several pieces to increase the number of planting material. The segment of corm to be used as a propagule should have at least one eye and a portion of basal plate or root zone. Better results can be obtained when radial cuts are made. The corms are cut 7 to 10 days before planting. Small corms can be divided into 3 to 4 pieces while the large one can be divided into 7 to 10 pieces (Gromov, 1972) which helps in providing benefits to the growers in increasing the planting materials.

Materials and Methods

Experimental site and duration: A field experiment entitled was conducted at Horticultural Experimental Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, during Rabi season of 2016-17 from November to April.

Experimental design: 4 x 3 (4 varieties x 3 corm sizes) factorial experiment was laid out in a Factorial Randomized Block Design with 3 replications.

Treatments of the experiment: Gladiolus variety (V_1: Deepest Red; V_2 :Jessica; V_3: Amsterdamand; V_4: Esta Bonita) and corm sizes (C_0: whole corm; C_1: Half size corm; C_2: 1/3rd corm were used in the experiment.

Plot size: The size of unit plot was 2 m x 2m.

Procedure for the application of treatments: Few corms were cut into two sections and few into three sections retaining a bud with each section. Bavastin was applied to the segments and whole corm to prevent fungus. Then the segments and whole corms are treated with GA_3 to break dormancy.

Planting of the corms: Corms were planted at 5 cm depth in the plot maintaining 30cm x 20 cm spacing. In each plot, 20 corms were planted.

The different treatment combinations are as follows: $T_1(V_1C_0)$ Deepest Red x Full size corm;$T_2(V_1C_1)$

Table-1 : Effect of Cut Corms on Floral parameters on different Gladiolus (*Gladiolus grandiflorus* L.) varieties.

Levels of corm size (C)	Days to Spike Emergence Levels of Varieties (V)					Spike Length (cm) Levels of Varieties (V)				
	V_1	V_2	V_3	V_4	Mean (C)	V_1	V_2	V_3	V_4	Mean (C)
C_0	72.33	**55.27**	78.83	83.27	**72.43**	71.15	55.74	83.39	**94.00**	**76.07**
C_1	70.50	63.67	81.50	98.33	**78.50**	68.89	43.05	76.50	90.92	**69.84**
C_2	67.93	65.53	84.90	100.43	**79.70**	65.89	41.91	72.13	86.59	**66.63**
Mean(V)	**70.26**	**61.49**	**81.74**	**94.01**		**68.64**	**46.90**	**77.34**	**90.50**	
Comparison	**F test**	**S.Ed (±)**	**C.D (5%)**			**F test**	**S.Ed (±)**	**C.D.(5%)**		
Due to Varieties	**S**	0.52	1.08			**S**	1.48	3.07		
Due to Corm Size	**S**	0.45	0.94			**S**	1.28	2.56		
Interaction (V x C)	**S**	0.90	1.88			**S**	2.56	5.32		

Table-2 : Effect of Cut Corms on Floral parameters on different Gladiolus (*Gladiolus grandiflorus* L.) varieties.

Levels of corm size (C)	Number of Florets per spike Levels of Varieties (V)					Diameter of basal Floret (mm) Levels of Varieties (V)				
	V_1	V_2	V_3	V_4	Mean (C)	V_1	V_2	V_3	V_4	Mean (C)
C_0	12.27	10.93	**14.83**	12.63	**12.67**	88.21	76.73	112.62	**125.42**	**100.75**
C_1	11.83	9.28	14.47	11.93	**11.88**	82.34	71.64	108.10	122.55	**96.16**
C_2	10.87	7.63	13.73	11.20	**10.86**	78.16	67.74	105.53	119.00	**92.61**
Mean (V)	**11.66**	**9.28**	**14.34**	**11.92**		**82.90**	**72.04**	**108.75**	**122.32**	
Comparison	**F test**	**S.Ed(±)**	**C.D (5%)**			**F test**	**S.Ed(±)**	**C.D.(5%)**		
Due to Varieties	**S**	0.27	0.58			**S**	0.71	1.49		
Due to Corm Size	**S**	0.24	0.50			**S**	0.62	1.29		
Interaction (V x C)	**S**	0.48	1.00			**S**	1.24	2.58		

Deepest Red x Half size corm; $T_3(V_1C_2)$ Deepest Red x One-third corm size; $T_4(V_2C_0)$ Jessica x Full size corm; $T_5(V_2C_1)$ Jessica x Half size corm; $T_6(V_2C_2)$ Jessica x One-third corm size; $T_7(V_3C_0)$ Amsterdam x Full size corm, $T_8(V_3C_1)$; Amsterdam x Half size corm; $T_9(V_3C_2)$ Amsterdam x One-third corm size; $T_{10}(V_4C_0)$ Esta Bonita x Full size corm; $T_{11}(V_4C_1)$ Esta Bonita x Half size corm; $T_{12}(V_4C_2)$ Esat Bonita x One-third corm size

Results and Discussion

Floral Parameters

Number of Days taken for Spike Emergence: Minimum number of days taken for spike emergence was recorded in V_2 (61.49) followed by V_1 (70.26) whereas maximum was recorded in V_4 (94.01). Variation in number of days taken for spike emergence may be due to genetical factors and temperature prevailing during the crop growth. Minimum number of days taken for spike emergence was found in C_0 full corm (72.43) followed by C_1 (78.50) whereas maximum was recorded in C_2 (79.70). Interaction effect revealed that minimum number of days taken for spike emergence (55.27) was recorded in T_4 followed by T_1 (72.33) whereas maximum number of days was in T_{12} (100.43). Large size corm helps the plant for growth and development with supplying storage nutrients in the corm which is the ultimate result of minimum days for emergence of spike. Similar findings were also found by Bhat *et al*. (2009) in gladiolus.

Spike length (cm) : Maximum spike length was recorded in V_4 (90.50cm) followed by V_3 (77.34cm) whereas minimum was recorded in V_2 (46.90cm).

Table-3 : Effect of Cut Corms on yield parameters on different Gladiolus (*Gladiolus grandiflorus* L.) varieties

Levels of corm size (C)	Weight of daughter corms per plant (g) Levels of Varieties (V)					Number of cormels per plant Levels of Varieties (V)				
	V_1	V_2	V_3	V_4	Mean(C)	V_1	V_2	V_3	V_4	Mean(C)
C_0	24.77	28.82	**52.85**	48.43	**38.72**	**59.57**	18.07	41.73	33.80	**38.29**
C_1	24.43	22.37	43.50	45.90	**34.05**	39.33	16.50	28.30	28.63	**28.19**
C_2	20.93	18.93	40.17	41.20	**30.31**	36.87	8.63	24.83	20.40	**22.68**
Mean (V)	**23.38**	**23.37**	**45.51**	**45.178**		**45.26**	**14.40**	**31.62**	**27.61**	

Comparison	F test	S.Ed(±)	C.D (5%)	F test	S.Ed(±)	C.D.(5%)
Due to Varieties	**S**	0.48	0.98	**S**	0.43	0.89
Due to Corm Size	**S**	0.41	0.86	**S**	0.37	0.77
Interaction (V x C)	**S**	0.83	1.71	**S**	0.75	1.55

Maximum number of leaves was found in C_0 (76.07cm) followed by C_1 (69.84cm) whereas minimum from C_2 (66.63cm). Interaction effect revealed that maximum spike length (94.00cm) was recorded in T_{10} followed by T_7 (83.39cm). The spike length was found to be minimum in T_6 (41.91cm) (Table-1).

This might be due to the higher amount of stored food material from large corm which resulted in larger spike length. Similar results were also reported by Dod *et al.* (1989) and Bhattacharjee (1981).

Number of florets per spike: Maximum number of florets per spike was recorded in V_3 (14.34) followed by V_4 (11.92) whereas minimum was recorded in V_2 (9.28). Maximum number of florets per spike was found in C_0 (12.67) followed by C_1(11.88) whereas minimum was recorded in C_2 (10.86). Interaction effect revealed that maximum number of florets per spike (14.83) was recorded in T_7 followed by T_{10} (12.63) whereas minimum in T_6 (7.63).

Plant height and spike length had direct influence on number of florets per spike and improvement in spike length and plant height directly increased number of florets per spike. Similar findings were given by Mahesh *et al.* (2011).

Diameter of basal floret (mm): Maximum diameter of basal floret was recorded in V_4 (122.32mm) followed by V_3 (108.75) whereas minimum was recorded in V_2 (72.04mm). The varieties varied significantly with respect to the floret diameter (Ram *et al.*, 2005; Rashmi, 2006). This may be due to different plant height of these varieties. Diameter of florets indicating that with the increment of plant height this associated character could be improved (Kumar *et al.*, 2011). Maximum diameter of basal floret was found in C_0 full corm (100.75mm) followed by C_1 (96.16mm) whereas minimum was recorded in C_2 (92.61mm). Interaction effect revealed that maximum diameter of basal floret (125.42mm) was recorded in T_{10} followed by T_7 (112.62mm). The diameter of minimum in T_6 (67.74 mm) (Table-2).

Yield Parameters

Weight of daughter corms (g): Maximum weight of daughter corms was recorded in V_3 (45.51g) followed by V_4 (45.18g) whereas minimum was recorded in V_2 (23.37g). Maximum weight of daughter corms was found in C_0 (38.72g) followed by C_1 (34.05g) whereas minimum was recorded in C_2 (30.31g). Interaction effect revealed that maximum weight of daughter corms (52.85g) was recorded in T_7 followed by T_{10} (48.43g) whereas minimum in T_6 (18.93).

This may be attributed to the good vegetative growth of plants in initial stages, which provides good amount of photosynthates for storage in corms. It may be mentioned here that when the half corm or whole corm were planted, the innermost corms developed on the terminal bud were larger and heavier than the outer corms which were smaller and lighter, implying that the available food materials were first translocated to the central corms and thereafter to the laterals. Similar results were given by Mahasen *et al.* (2015).

Number of Cormels per plant: Maximum number of cormel formed per plant was recorded in V_1 (45.26) followed by V_3 (31.62) whereas minimum was recorded in V_2 (14.40). Production of number of cormels varied with variety Maximum number of cormel formed per plant was found in C_0 (38.29) followed by

C_1 (28.12) whereas minimum was recorded in C_2 (22.68). The result is in an agreement with the findings of Joshi *et al*. (2012). Interaction effect revealed that maximum number of cormel formed per plant (59.57) was recorded in T_1 followed by T_7 (41.73) whereas minimum in T_6 (8.63) (Table-3).

On the basis of present investigation early spike emergence was found in V_2 (Jessica) whereas spike length was best in V_4 (Esta Bonita) followed by V_3 (Amsterdam). Regarding number of florets per spike, no. of daughter corms per plant was found to be best in V_3 (Amsterdam). Full corms were found to be best in terms of all vegetative and floral parameters but in terms of corms and cormel production cut corms were found to be better. So cut corm can be used for commercial gladiolus production and this might reduce the cost for planting materials.

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