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Consequence of corm size and spacing on flowering and post-harvest parameter in gladiolus

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Abstract
An investigation was carried out at the Horticultural Research Farm Department of Horticulture, Banaras Hindu University, Varanasi, 221005 (Uttar Pradesh) during the year 2016-17 to standardize the combination of optimum corm sized and spacing for the production of gladiolus with better flowering and post-harvest potentials. The investigation was laid out factorial randomized block design with three replications. The data on various flowering and post-harvest parameters recorded from 5 randomly selected plants from each treatment in each replication. The treatment comprises nine combination with three corm sizes viz. C_1 (2-3 cm), C_2 (3.1-4 cm) and C_3 (4.1-5 cm) and three spacing S_1 (30 × 20 cm), S_2 (30 × 25 cm) and S_3 (30 × 30 cm). Results revealed that combination effect of 4.1-5.0 cm corn size and 30 × 30 cm spacing result maximum number of florets per spike (15.6), diameter of 1st floret (9.2 cm), diameter of 3rd floret (9.0 cm), diameter of 5th floret (8.8 cm), length of spike at colour show (49.4 cm), 1st floret opening (57.7 cm), length of spike at last floret opening (68.6 cm), percentage of florets opened in vase (88.5), vase life (18.0 days), floret longevity (8.0 days) and length of spike after post-harvest (67.0 cm) also provide minimum days taken to initiation of spike (66.8 days), days taken to colour show (74.0 days) and days taken to opening of 1st floret (78.5 days). On contrary the combination effect of 2-3cm corm size and 30×25 cm showed prominent result in terms of highest (9.8 days) days for 1st sprouting, durability of 2nd floret (6.5 days), durability of 3rd floret (6.6 days) and days taken to last floret withering (110.03 days).

Keywords: Gladilous, corm, flower and pos-tharvest etc.

1. Introduction
Flowers symbolize beauty, purity, peace and love. These are intricately associated with social beliefs and no social function complete without the use of flower, especially in a country like India where it is a popular saying that flowers are associated with man from birth till death. India has great potential for floriculture due to availability of sufficient winter sunshine, high temperature, good soil fertility, good water quality, different climatic zones for different type of products and low labour investment costs. In the flower industry, significant changes are occurring in the competitive relationships worldwide (Singh, 2006) [18].

Gladiolus (*Gladiolus grandiflorus* L.) is a popular flowering plant which belongs to family Iridaceae and having chromosome number (2n) = 30-120. The name gladiolus was coined by Pliny the Elder (A.D. 23-79) to describe the shape of the leaf which resembles that of sword (Latin word *gladius* meaning sword). Its centre of origin is South Africa and is attributed as "Queen of bulbous ornamentals" due to its popularity amongst the bulbous ornamentals cultivated in the world. Gladioli are said to be cultivated since the days of ancient Greece. Gladiolus is valued for its majestic spikes, beautiful colours attractive shapes and excellent keeping quality or vase life. It cut spikes remain fresh at least for a week and are in great demand for presentation and interior decoration. Gladiolus occupies prime position in the International cut flower trade plant and among the bulbus cut flowers, it occupies a prestigious position. Its cut spikes are in huge demand for bouquets and flower arrangements because of long length of spikes, different colors and forms of florets. Besides, it is also grown in the beds for garden display and in pots for its magnificent inflorescence.

Gladiolus is commercially propagated through corms and cormels. It is well established fact that the size of corms is a major factor influencing the quality and yield of gladiolus. Different factors such as size of corms, spacing, planting depth, planting time and fertilizer management influence the production and quality of gladiolus flower (Arora and Khanna, 1990) [2]. Among these, size of corm and spacing are very important. The size of corms and planting density play important role for obtaining good plant growth, quality spikes, corm and cormel production (Singh, 2000) [18] ; Bijimol and Singh, 2001) [5]. The size of the corm influences the growth, development, yield and quality of flowers and propagules. Similarly, spacing affects the

photosynthetic activities as well as availability of nutrients to the plants. Hence, affect the quality of spikes and corms considerably. The planting of standard corm size at an appropriate spacing would help not only in obtaining the increased production but also proper utilization of land and other resources. Keeping the above facts in view, the present investigation was conducted with the objectives of to see the effect of corm size and spacing on flowering and post-harvest life of gladiolus plants.

Materials and Methods

The present investigation was carried out at the Horticultural Research Farm Department of Horticulture, Banaras Hindu University, Varanasi, 221 005 (Uttar Pradesh) during the year 2016-17 to standardize the combination of optimum corm sized and spacing for the production of gladiolus with flowering and post-harvest potentials. The investigation was laid out factorial randomized block design with three replications. The data on various flowering and post-harvest parameters recorded from 5 randomly selected plants from each treatment in each replication. The treatment comprises nine combination with three corm sizes viz. C_1 (2-3 cm), C_2 (3.1-4 cm) and C_3 (4.1-5 cm) and three spacing S_1 (30 × 20 cm), S_2 (30 × 25 cm) and S_3 (30 × 30 cm). The details of treatment combination given in Table 1.The planting of gladiolus cv. Punjab Morning was done on 10 November, 2016 in winter season. The results of the experiment have been analyzed statistically for interpretation of results.

Table 1: Treatment details

Sl. No.	Notations	Treatments
1	T_1	C_1(2-3cm) × S_1(30×20cm)
2	T_2	C_1(2-3cm) × S_2(30×25cm)
3	T_3	C_1(2-3cm) × S_3(30×30 cm)
4	T_4	C_2(3.1-4.0 cm) × S_1(30×20cm)
5	T_5	C_2(3.1-4.0 cm) × S_2(30×25cm)
6	T_6	C_2 (3.1-4.0 cm) × S_3(30×30 cm)
7	T_7	C_3 (4.1-5.0 cm) × S_1(30×20cm)
8	T_8	C_3(4.1-5.0 cm) × S_2(30×25cm)
9	T_9	C_3 (4.1-5.0 cm) × S_3(30×30 cm)

Results and Discussion

Flowering Parameters

The data pertaining to the influenced of corm sized and spacing on flowering parameter are presented in Table 2 and Table 3. The minimum days taken to initiation of spike (66.8 days) was recorded in T_9 followed by T_8 (71.9 days), T_6 (72.0 days), T_5 (73.0 days) and T_4 (74.2 days) whereas maximum days taken to initiation of spike were recorded in T_1 (80.3 days). These results are in accordance with the findings of Kumar and Singh (1998) [9], Singh and Singh (2004) [16], Bhat and Khan (2007) [3]. Spike initiation and blooming decreased with increasing corm size as reported by Sharma and Gupta (2003) [15]. The minimum days taken to colour show (74.0 days) was recorded in T_9 followed by T_8 (74.3 days), T_7 (75.6 days), T_6 (77.3 days) and T_5 (79.3 days) whereas maximum days taken to colour show was recorded in T_1 (84.6 days). Gupta *et al.* (2014)[7] found that bulb sized (4.1-4.5 cm) and spacing (30 × 14 cm) showed better performance with respect to number of days taken for 1st floret opening (104.45 days) and highest spike length (73.44 cm) in gladiolus. The maximum number of florets per spike (15.6) was recorded in the treatment T_9 which was statistically at par with T_7 (15.4) and T_8 (15.3) whereas the minimum number of florets per spike (13.1) recorded in T_2. Kumar and Singh (1998) [9] found that best performance with the planting of larger bulbs size (2.6 - 3.0 cm) and wider spacing of plants (30 cm apart). Number of florets per spike (36.46) and number of spikes per clump (2.21) in terms of quality and quantity were increased with increasing in bulb size and planting distance in tuberose. The minimum days taken to opening of 1st floret (78.5 days) recorded in T_9, days taken to opening of 2nd floret (85.9 days) in the treatment T_4 and days taken to opening of 3rd floret (91.3 days) was recorded in T_8. The maximum diameter of 1st floret (9.2 cm), 3rd floret (9.0 cm) and 5th floret (8.8 cm) recorded in T_9. The similar findings were observed by Anwar and Maurya (2005) [1], Bhat and Khan (2007) [3] and Ramachandrudu and Thangam (2007) [12]. Bhat *et al.* (2008) [4] also reported floret diameter was significantly improved in the largest corm size (5.1-5.5 cm) in gladiolus. The maximum length of spike at colour show (49.4 cm) and 1st floret opening (57.7 cm) were recorded in T_9 whereas length of spike at last floret opening (68.6 cm) was recorded in T_9 and T_8. The maximum length of rachis (31.6 cm) recorded in T_8 which was statistically at par with all other treatments and the minimum length of rachis (29.9 cm) recorded in T_2. Singh (2000) [18] found that large sized corms (3.8-6.5 cm) significantly affected on length of spike. Mane *et al.* (2007) [9] observed that widest spacing (20 × 25 cm) and bigger bulb sized (3 cm) recorded highest rachis length (28.09 cm) and Dogra *et al.* (2012) [6] found that corms planted at a spacing of (40 × 40 cm) exhibited highest rachis length (78.00 cm). The maximum durability of 1st floret (6.1 days) was recorded in the treatment T_4 whereas maximum durability of 2nd floret (6.5 days) and 3rd floret (6.6 days) was recorded in T_2. The maximum days taken to last floret withering (110.03 days) were recorded in T_2 whereas minimum days taken to last floret withering was recorded in T_3 (103.3 days). Singh (2000) found that large duration of flowering not influenced by different size of mother corms in gladiolus. Ramachandrudu and Thangam (2007) [12] found that flowering duration was not significantly affected by spacing (45 × 20 cm).

Table 2: Effect of corms size and spacing on flowering parameters of gladiolus.

Treatments	Days taken to initiation of spike	Days taken to colour show	Number of floret per spike	Days taken to opening of 1st floret	Days taken to opening of 2nd floret	Days taken to opening of 3rd floret	Diameter of 1st floret (cm)	Diameter of 3rd floret (cm)	Diameter of 5th floret (cm)
T_1	80.3	84.6	13.6	87.3	92.1	99.0	7.8	8.6	8.4
T_2	78.5	83.0	13.1	89.2	89.7	96.7	7.7	8.5	8.4
T_3	74.3	82.6	13.4	85.9	87.3	97.3	7.1	8.5	8.3
T_4	74.2	79.8	13.8	87.1	85.9	96.1	8.7	8.7	5.6
T_5	73.0	79.3	13.9	83.5	86.7	95.6	8.7	8.9	6.9
T_6	72.0	77.3	14.0	81.1	87.2	94.3	8.7	8.9	7.3
T_7	75.1	75.6	15.4	86.4	90.3	93.4	8.9	8.5	8.4
T_8	71.9	74.3	15.3	83.7	90.6	91.3	8.6	8.6	8.4
T_9	66.8	74.0	15.6	78.5	88.8	91.7	9.2	9.0	8.8
C.D. at 5%	2.330	1.457	0.692	3.25	1.341	1.188	0.390	0.390	0.747

Table 3: Consequence of corms size and spacing on flowering parameters of gladiolus.

Treatments	Length of spike at colour show (cm)	Length of spike at1st floret opening (cm)	Length of spike at last floret opening (cm)	Length of rachis (cm)	Durability of 1st floret	Durability of 2nd floret	Durability of 3rd floret	Days taken to last floret withering
T_1	43.3	48.1	59.9	30.9	5.7	6.1	5.5	107.9
T_2	48.3	45.4	64.2	29.9	5.4	6.5	6.6	110.3
T_3	42.5	53.7	62.5	31.5	5.4	5.9	5.7	103.3
T_4	48.2	56.4	64.3	29.9	6.1	5.7	6.3	106.1
T_5	47.8	56.4	65.1	30.2	5.0	6.1	5.9	109.7
T_6	47.5	56.1	65.5	30.6	5.4	6.1	5.9	108.8
T_7	49.2	56.4	62.4	30.5	5.9	5.6	5.3	104.6
T_8	48.5	57.2	68.6	31.6	5.8	6.0	6.1	106.4
T_9	49.4	57.7	68.6	31.0	4.5	5.9	6.1	108.2
C.D. at 5%	3.425	3.401	5.179	2.303	0.513	0.406	0.471	4.054

Post-harvest parameters

The data pertaining to the consequence of corm sized and spacing on post-harvest parameter are presented in Table 4.The maximum percentage of florets opened in vase (88.5) was recorded T_9 which was statistically at par with T_6 (81.4), T_7 (82.2) and T_8 (83.9) whereas, it was the minimum percentage of florets opened in vase (64.9) recorded in T_1. The maximum vase life (18.0 days) was recorded in T_9 which was statistically at par with T_8 (17.1 days) whereas it was minimum (14.5 days) in T_2. The carbohydrate reserves in the stem probably maintained the pool and dry matter and repairable substances, especially in petals, thus promoting respiration and extending longevity (Coorts, 1973) [6]. Beneficial effect of corm sized, spacing on keeping quality and vase life of cut flower have also been reported by Rohidas *et al*. (2011) [14] and Regar *et al*. (2016) [12]. The maximum floret longevity (8.0 days) was recorded in T_9 which was statistically at par with all other treatments except T_3. The minimum floret longevity (6.5 days) was recorded in T_6. The maximum length of spike after post-harvest (67.0 cm) was recorded in T_9 which was statistically at par with T_8 (65.0 cm), T_3 (64.7 cm) and T_1 (65.7 cm). The similar finding was reported by Mane *et al.* (2017) [10] and Regar *et al*. (2016) [12] in gladiolus.

Treatments	Percentage floret open at vase	Vase life (Days)	Floret longevity (Days)	Length of spike after post-harvest (cm)
T_1	64.9	15.5	6.9	65.7
T_2	70.9	14.5	6.8	61.6
T_3	76.8	16.2	8.0	64.7
T_4	74.1	16.7	6.6	57.3
T_5	75.8	15.5	6.7	60.0
T_6	81.4	15.0	6.5	60.7
T_7	82.2	16.3	6.9	64.3
T_8	83.9	17.1	7.0	65.0
T_9	88.5	18.0	7.5	67.0
C.D. at 5%	9.881	1.011	1.470	3.033

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