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Short communication

Effect of temperature and period of storage on breaking dormancy in gladiolus (*Gladiolus grandiflorus* Hort.) corms

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ABSTRACT

An experiment was conducted in 2010-2011 at Indian Institute of Horticultural Research, Bengaluru, on three gladiolus cultivars viz., 'Arka Amar', 'Darshan' and 'Kum Kum' to study effects of storage temperature (4°C and room temperature 27±2°C) and length of storage (50, 70 and 90 days) on dormancy of corms. Cv. 'Kum Kum' registered minimum number of days for sprouting (42.71 days), spike emergence (116 days) and days to opening of first floret (128 days). Corms stored at 4°C resulted in lowest number of days for-sprouting (45.24 days), days to spike emergence (114.63 days) and days to opening of first floret (126.60 days) and resulted in highest sprouting percentage (58.7%). Interaction effects revealed that cv. 'Kum Kum' stored at 4°C for 90 days after harvest took minimum number of days to sprouting (25.07 days), days to spike emergence (90.38 days) and days to opening of first floret (102.38 days) resulting in 100% sprouting.

Key words: Gladiolus, dormancy, storage, corms

Gladiolus (*Gladiolus grandiflorus* Hort.) is a popular bulbous ornamental flower crop belonging to the family Iridaceae, and is aptly known as 'Queen of bulbous flowers'. It is native to the Mediterranean region, tropical South Africa and Asia. It is also cultivated in various states of India, mainly, West Bengal, Maharashtra, Uttar Pradesh, Karnataka, Uttaranchal, Punjab, Haryana, Sikkim, Jammu and Kashmir, Gujarat, Himachal Pradesh, Tamil Nadu, Madhya Pradesh and Rajasthan (Arora *et al*, 2002). It is commercially propagated by corms and cormels that have a dormancy period of about three and six months, respectively. The degree of dormancy in gladiolus varies with the cultivar. Dormancy of cormels is longer than that of corms (Ginzburg, 1973). Temperature during storage of corms affects dormancy: higher temperature enhances dormancy while lower temperature reduces it (Denny, 1936). Thus, the present investigation was undertaken to study the effect of temperature and storage period on dormancy of corms in three gladiolus genotypes and its effect on quality parameters.

MATERIAL AND METHODS

The experiment was conducted during the year 2010-2011 at Indian Institute of Horticultural Research, Hessaraghatta, Bengaluru, located at an altitude of 890 metres above mean sea level, latitude $13^{0}58'$ North and longitude $77^{0}37'$ East. Three gladiolus genotypes, viz., 'Arka Amar', 'Darshan' and 'Kum Kum' were studied. The experiment was laid out in factorial Randomized Complete Block Design (RCBD) with three factors (variety at 3 levels, 2 different storage temperature and different storage duration) and three replications. Statistical analysis was done using SAS-GLM (SAS, 2008) V 9.2 available with Statistics Laboratory, IIHR, Bengaluru.

Uniform-sized corms of cultivars Arka Amar, Darshan and Kum Kum (with diameter ranging from 5.5 to 6.5cm, 5 to 5.5cm and 4 to 4.5cm, respectively) were collected after harvest and stored at either 4ºC or ambient condition (27±2ºC). Five corms from each treatment were taken at 50, 70 and 90 days interval and planted, with three replications. Plants were grown using recommended package of practices. Observations were recorded for fifteen plant characters, viz., sprouting percentage (%), days to sprouting, days to spike emergence, days to opening of first floret, plant height (cm), spike length (cm), rachis length (cm), floret diameter (cm), number of florets per spike, number of marketable spikes per corm (a spike having more

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than twelve florets was considered marketable), total number of spikes per corm, number of florets open at a given time, flowering duration (days), spike weight (g) and vase life (days).

Significant difference was found in parameters for days to sprouting, sprouting percentage, days to spike emergence and days to opening of first floret, whereas, there was no significant difference with respect to plant height and floral characters studied.

Days to sprouting

Data presented in Table 1 reveal that minimum number of days taken to sprout was recorded in 'Kum Kum' (42.7 days), followed by 'Arka Amar' (58.8 days) and 'Darshan' (74.6 days). Storage at 4°C resulted in earlier sprouting (45.2 days) compared to that at ambient temperature (72.1 days). Minimum number of days to sprout was observed in 'Kum Kum' (25.1 days) when corms were stored at 4°C for 90 days. This finding is in accordance with results of Jean Ming Hong *et al* (1997) and Sun Yan Zhi and Yi Ming Fang (2004) who reported that storage at 5°C improved germination within 21 days. This might be due to storing the corms at low temperature which results in faster breaking on dormancy. Minimum number of days to sprout was seen when corms of 'Kum Kum' were stored at 4°C (34.8 days), whereas, corms of 'Darshan' stored at ambient conditions took maximum number of days to sprout (90.6 days). Three-way interaction effects revealed that corms of 'Kum Kum' stored for 90 days at 4°C took the least number of days to sprout (25.0 days). On the contrary, corms of 'Darshan' stored for 50 days at room temperature took maximum number of days to sprout (97.3 days). Significant difference was seen among treatments.

Days to spike emergence

Interaction between storage temperature and duration of storage showed significant difference for days to spike emergence (Table 1). Minimum number of days to spike emergence was seen in 'Kum Kum' (116 days), followed by 'Arka Amar' (130.3 days), Maximum number of days to spike emergence was observed in 'Darshan' (141.7 days). Storing corms at 4°C resulted in earlier spike emergence (114.6 days) compared to those at ambient conditions (143.5 days). Hsieh and Huang (1970) reported that 40 day treatment at 5°C successfully broke dormancy in gladiolus leading to earliness in spike emergence. This may be attributed to the fact that storing corms at low temperature reduces ABA content and increases GA_3 content, thus helping overcome dormancy, leading to earlier spike emergence. There was significant difference in time taken to spike emergence when corms were stored for 90 days (110.1 days), followed by 70 days (126.3 days) and 50 days (151.4 days). Minimum number of days taken to spike emergence was noticed when corms of 'Arka Amar' were stored at 4°C (107.3 days). Whereas, corms of 'Darshan' stored at ambient conditions took maximum number of days to spike emergence (157.6). Three-way interaction effects revealed that corms of 'Arka Amar' stored for 90 days at 4°C took the least number of days for spike emergence (81.6 days). On the other hand, corms of 'Arka Amar' stored for 50 days at room temperature took maximum number of days to spike emergence (171.0 days).

Days to opening of first floret

All the three factors viz., variety, storage temperature and duration of storage were found to be significantly affecting days to opening of first floret (Table 1). Minimum number of days taken to opening of first floret was seen in 'Kum Kum' (128 days), followed by 'Arka Amar' (142.3 days), whereas, maximum number of days to opening of first floret was observed in 'Darshan' (153.7). Corms stored at 4^0C were early to first flower emergence (126.6 days) compared to ambient conditions (156 days), differing significantly. Suh and Kwack (1992) reported that longer the corms stored at 5°C, greater was the effect on breaking dormancy. In the present study, 'Arka Amar' stored at 4°C for three months took less number of days for flowering (93.60 days). Three-way interaction effects revealed that corms of 'Arka Amar' stored for 90 days at 4°C took the least number of days to first flower emergence (93.6 days). On the other hand, corms of 'Arka Amar' stored for 50 days at room temperature took maximum number of days for opening of the first floret (183 days).

Sprouting percentage

Sprouting percentage ranged between 7.77 and 78.35%. Maximum sprouting was recorded in 'Kum Kum', while minimum was observed in 'Darshan'. Seenivasan (2001) reported genotypic variation with respect to per cent sprouting. Storage at 4°C resulted in maximum sprouting (58.70%) compared to storage at ambient temperature (22.41%). Three-way interaction effects showed that corms of 'Arka Amar' and 'Kum Kum' stored at 4°C for 90 days sprouted within 50 days of planting, resulting in 100% sprouting. On the contrary, corms of 'Arka Amar' and 'Darshan' stored at room temperature for 50 and 70 days failed to sprout within the first 50 days of planting.

Table 1. Effect of variety, storage temperature, storage duration and their interactions on days to sprouting, days to spike emergence and days to opening of first floret in gladiolus

Treatment combination	Days to sprouting			Days to spike emergence			Days to opening of first floret		
$V_1T_1D_1$	62.0			137.9			149.9		
$V_1T_1D_2$	39.0			102.7			114.7		
$V_1T_1D_3$	26.0			81.6			93.6		
$V_1T_2D_1$	86.8			171.0			183.0		
$V_1T_2D_2$	83.8			158.7			170.7		
$V_1T_2D_3$	54.9			129.9			141.9		
$V_2T_1D_1$	68.3			142.6			154.6		
$V_2T_1D_2$	57.0			119.8			131.8		
$V_2T_1D_3$	50.4			114.7			126.7		
$V_2T_2D_1$	97.3			167.2			179.2		
$V_2T_2D_2$	94.3			161.3			173.3		
$V_2T_2D_3$	80.3			144.5			156.5		
$V_3T_1D_1$	41.0			142.3			154.3		
$V_3T_1D_2$	34.4			99.7			111.7		
$V_3T_1D_3$	25.0			90.4			102.4		
$V_3T_2D_1$	62.2			148.2			160.2		
$V_3T_2D_2$	52.6			116.0			128.0		
$V_3T_2D_3$	37.0			99.7			111.7		
V	V_1	V_2	V_3	V_1	V_2	V_3	V_1	V_2	V_3
	58.7	74.5	42.7	130.3	141.7	116.0	142.3	153.7	128.0
T	T_1	T_2	-	T_1	T_2	-	T_1	T_2	-
	45.2	72.1	-	114.6	143.5	-	126.6	156.0	-
D	D_1	D_2	D_3	D_1	D_2	D_3	D_1	D_2	D_3
	70.2	60.1	45.6	151.5	126.3	110.1	163.5	138.3	122.1
	V_1	V_2	V_3	V_1	V_2	V_3	V_1	V_2	V_3
T_1	42.3	75.2	58.5	107.3	153.2	125.7	119.3	165.2	137.7
T_2	90.6	34.8	50.6	157.6	110.8	121.3	169.6	122.8	133.3
D_1	74.4	61.4	40.5	154.4	130.7	105.7	166.4	142.7	117.7
D_2	82.7	75.6	65.3	154.9	140.5	129.6	166.9	152.5	141.6
D_3	53.6	43.5	31.0	145.2	107.8	95.0	157.2	119.8	107.0
	D_1	D_2	D_3	D_1	D_2	D_3	D_1	D_2	D_3
T_1	58.4	43.5	33.8	140.9	107.4	95.5	152.9	119.4	107.5
T_2	82.1	76.9	57.4	162.1	145.3	124.7	174.1	157.3	136.7
CD *(P=0.05)*									
V		1.11			1.45			1.45	
T		0.91			1.18			1.18	
D		1.11			1.45			1.45	
V × T		1.57			2.05			2.05	
V × D		1.93			2.51			2.51	
T × D		1.57			2.05			2.05	
V × T × D		2.73			3.55			3.55	

V_1: Arka Amar
V_2: Darshan
V_3: Kum Kum

T_1: 4^0C
T_2: Room Temperature (27±2ºC)

D_1: 50 Days storage
D_2: 70 Days storage
D_3: 90 Days storage

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