

# Evaluation of Genotypes of *Gladiolus* for Vegetative and Floral Traits

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## ABSTRACT

An experiment was conducted at Indian Institute of Horticultural Research, Bangalore, India to evaluate vegetative and floral traits of 21 genotypes. Sprouting per cent of corms was the highest in two genotypes 'Shobha' and 'H. S. 82-11-27' (100 %) whereas low in 'H.S. 84-7-11' (68.5 %), 'Gladiolus callianthus' (70.6 %), and 'Arka Kesar' (76.5%). Day to sprouting was early in 'H. S. 86-32-11' (11.2 days), 'Shobha' (12 days) and 'H. S. 87-22-1' (12.2 days) but 'Gladiolus callianthus' recorded the maximum days to sprouting (30.0 days). Day to flowering was early in 'H.S. 88-10-22' (64.6), 'Shobha' (65.8 days) and 'H.S. 84-7-11' (66.1 days) while late in 'H.S. 84-4-9' (92.6) 'Tilak' (91 days) and 'Gladiolus callianthus' (87.1 days). The genotype 'Gladiolus callianthus' recorded the shortest plant (94.8cm) followed by 'Hybrid selection 84-4-9' (102.6cm) and 'Kum Kum' (106.7cm) whereas the tallest plant in 'Poonam' (149.1cm), 'Shobha' (146.9cm) and 'Pink Friendship' (142.1cm). The genotype 'Arka Kesar' recorded the highest number of florets per spike (18.1) but 'Gladiolus callianthus' was with the least florets per spike (9.8). Numbers of marketable spikes per corm were high in 'Psittacinus hybrid' (2.0) 'H.S. 87-22-1' (1.9) and 'H.S. 88-4-8' (1.9), 'H.S. 82-11-27' (1.9) and 'Kum Kum' (1.7). 'H.S. 87-22-1' had long vase life (8.8 days) followed by 'H.S. 82-11-27' (8.4 days) while 'H. S. 88-4-8' had the shortest vase life (6.2 days). In respect of most traits, 'H.S.87-22-7' is proven as the most promising genotype as comparing against the rest of twenty genotypes. In addition, *Gladiolus callianthus* and *Psittacinus hybrid* are two different species that can be utilized in interspecific hybridization.

**Key words:** Corms, Evaluation, Genotype, florets, spikes, sprouting, traits, vase life

## INTRODUCTION

*Gladiolus* (*Gladiolus grandiflorus* Hort.) is one of the most popular ornamental bulbous flowers grown for cut flower and garden display. The genus *Gladiolus* has 260 species. Among them about 25 species are cultivated. Over 30,000 open pollinated varieties hybrids have been developed from the cultivated species (Misra *et al.*, 2003). Progress in producing new types and forms has accelerated largely due to need for desirable vegetative and floral traits, higher yields, and quality and disease resistance. Evolution of plants on account of mutation, recombination and natural selection, which resulted in several variations in flower form, size, color, growth habit, flowering time, flowering duration and disease resistance. The enthusiastic amateurs have made intelligent selections on such variations by close observations (Raghava, 1999). Many of the gladiolus genotypes have also been developed by hybridization and selection. Under plant improvement program, important genotypes of gladiolus are to be selected based on vegetative, floral and palynological characters for trait specific breeding (Dwivedi and Banerji, 2008). The present investigation were

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undertaken with the objective of evaluating different gladiolus genotypes for vegetative and floral traits.

## MATERIAL AND METHODS

The experiment was conducted in open field of Indian Institute of Horticultural Research, Hessaraghatta in Bangalore during August 2006 to June 2008. The experimental field is located at an altitude of 890 meters, and has latitude of 130.58' North and longitude of 770.37' East. The soil type of the experimental site is red loam. Twenty-one gladiolus genotypes (Table 1) were included for the evaluation of vegetative and floral traits.

Well-decomposed organic manure at the rate of 10 t/ha and 75 kg N, 100 kg P<sub>2</sub>O<sub>5</sub> and 100 kg K<sub>2</sub>O per hectare were incorporated into soils of experimental plots after thorough land preparation. Remaining 75 kg N was applied in two split doses. Corms were planted in the ridges of 1.6 m x 1.5 m having furrows between the ridges. Corms were immersed in 0.2% aqueous solution of bavistin for 20 minutes prior to planting. The experiment was laid out in a Randomized Complete Block Design with three replications. Twenty-eight uniform corms that were about to sprout having an average diameter of 5cm were selected, and planted in 2.4 m<sup>2</sup> beds. The rest of cultivation practices such as inter-cultivation, irrigation, and plant protection measures were followed as per recommendations. Thirteen characters as given in table 1, 2 and 3 were recorded at different stage plant growth.

## RESULTS

Genotype H.S. 86-32-11 was earliest (11.2 days) in sprouting followed by Shobha (12 days), and H.S. 87-22-1(12.12 days ). On the contrary, '*Gladiolus callianthus*' recorded the maximum days to sprouting (30.0 days) and *Psittacinus* hybrid (23.8 days) and Poonam (18.5 days) were also late in sprouting (Table 1). Highest sprouting percent and early sprouting characters signified the cultivar 'Shobha' as superior genotype to the remaining ones. Mean days to sprouting under present study was 16.08 days, which is in agreement with the findings of Nimbalkar *et al.*, (2007) who reported between 11 and 17.8 days for sprouting.

Days to spike emergence differed from 53.1 days to 81.6 days with a mean value of 66.9 days. Genotype 'H.S. 88-10-22' took shortest period (53.1 days) to spike emergence which was statistically at par with 'Shobha' (54.4 days) 'H.S. 84-7-11' (55.9 days) and Hybrid selection 84-6-13 (57.4 days). On the other hand, genotypes H.S. 84-4-9 (81.6 days), Tilak (80.89 days) and *Gladiolus callianthus* (77.3 days) required significantly longer time for spike initiation. Days to flowering differed from 64.6 days to 92.6 days among genotypes with a mean value of 78.3 days. The genotype H.S. 88-10-22 was earliest (64.6) to flowering followed by 'Shobha' (65.8 days), 'H.S. 84-7-11' (66.1 days) and 'H.S. 84-6-13' (70.1 days). Genotypes, H.S. 84-4-9 (92.6), Tilak (91 days) and '*Gladiolus callianthus*' (87.1 days) were significantly late for flowering (Table 1). Other investigators have also reported the varietal differences of gladiolus on days to spike emergence (Nagaraju and Parthasarathy, 2001) and flowering (Murthy, 2001) in India.

Plant height differed from 94.9cm to 149.1cm with a mean value of 124.1cm. The genotype '*Gladiolus callianthus*' recorded the shortest plant (94.9cm) but it was not significantly different from 'H.S. 84-4-9' (102.6cm) and 'Kum Kum' (106.7cm). Poonam had tallest plants (149.1cm) followed insignificantly by 'Shobha' (146.9cm)

(Table 1). The differences of plant height were between 94.9cm and 149.1cm in the present study, which approximately agrees with the range of plant height from 76cm to 151cm observed in 20 different genotypes by Sharga (2001). Spike length differed from 71.8cm to 122.3cm with a mean value of 99.6cm. The genotype 'Poonam' recorded the longest spike (122.3cm) insignificantly followed by 'Shobha' (120.3cm). *Gladiolus callianthus* recorded the shortest spike (71.8cm) ensued insignificantly by 'H.S. 84-4-9' with 77.8cm (Table 1). Rachis length differed from 33.8cm to 73.5cm with a mean value of 54.3cm. The genotype 'Poonam' had the longest rachis (73.5cm) the genotype '*Gladiolus callianthus*' had the shortest rachis (33.8cm).

Table 1: Genotypic performance on vegetative and floral traits

Genotypes	Days to sprouting	Days to spike emergence	Days to flowering	Plant height (cm.)	Spike length (cm.)	Rachis length (cm)
Aarti	12.33	65.07	76.46	115.07	90.99	50.43
Arka Kesar	13.50	74.85	84.39	136.40	108.77	66.10
Darshan	16.67	75.85	86.28	108.54	87.25	46.60
Dhiraj	13.67	68.90	81.67	113.07	90.43	52.99
Kum Kum	14.17	65.74	78.94	106.74	89.61	52.86
Pink Friendship	14.00	73.26	84.22	142.07	109.04	63.29
Poonam	18.50	62.57	73.67	149.14	122.30	73.54
Sapna	12.67	66.00	77.57	130.89	105.90	64.90
Shobha	12.00	54.42	65.83	146.94	120.33	63.47
Tilak	12.83	80.89	90.98	131.76	105.08	62.92
H.S. 82-11-27	15.17	64.89	77.29	116.81	94.24	49.75
H.S. 84-4-9	16.17	81.63	92.62	102.61	77.83	37.17
H.S. 84-6-13	14.33	57.44	70.07	121.00	97.37	52.30
H.S. 84-7-11	12.50	55.95	66.07	134.25	108.82	60.60
H.S. 86-32-11	11.17	66.97	79.04	129.74	103.82	49.53
H.S. 87-1-1	12.83	65.09	76.00	131.33	106.79	48.76
H.S. 87-22-1	12.17	62.70	73.83	135.32	112.38	59.04
H.S. 88-4-8	15.00	65.49	77.24	118.75	94.32	52.47
H.S. 88-10-22	15.83	53.13	64.58	126.10	103.57	51.47
<i>G. callianthus</i>	30.00	77.32	87.07	94.85	71.80	33.82
<i>P. hybrid</i>	23.83	66.92	80.38	114.08	91.87	48.00
Mean	15.21	66.91	78.30	124.07	99.64	54.28
F-test	**	**	**	**	**	**
CD @ 5%	1.47	6.90	6.65	9.66	10.26	6.55

Figures within parentheses are transformed values.

\*\* Highly Significant H.S.=Hybrid selection, *G.*=*Gladiolus*, *P.* *Psittacinus*

Floret diameter varied from 8.2cm to 12.1cm with a mean value of 10.1cm (Table 2). Genotype 'Pink Friendship' had the biggest floret diameter (12.1cm), and it was at par with 'Sapna' (12.0cm). Genotype '*Psittacinus* hybrid' had the smallest floret diameter (8.2cm) followed inconsequentially by '*Gladiolus callianthus*' (8.6cm). The number of florets per spike varied from 9.8 to 18.1 with a mean value of 14.8. The genotype 'Arka Kesar' recorded the highest number of florets per spike (18.1) ensued by 'Shobha' (17.7) and 'Pink Friendship' (17.4). On the contrary, '*Gladiolus callianthus*' recorded the fewest florets per spike (9.8) followed significantly by 'H.S. 84-4-9' (11.0) and 'H.S. 87-1-1' with 12.9 (Table 2). '*Psittacinus* hybrid' was rated as the best one for the performances of the characters such as number of spikes per corm and number of marketable spikes per corm whereas the lowest number of marketable spike per corm was in '*Gladiolus callianthus*'. The number of spikes per corm in the present study ranged from 1.1 to 3.1, which nearly agrees with the range 1.0 to 2.8 spikes per corm in different exotic genotypes reported by Gupta *et al.* (2001).

The number of spikes per corm varied from 1.1 to 3.1 with a mean value of 1.9. Genotype '*Psittacinus* hybrid' had the highest number of spikes per corm (3.1) followed significantly by '*Gladiolus callianthus* (2.5) and 'H.S. 87-22-1' (2.5) whereas the genotype 'Sapna' having the fewest number of spikes per corm (1.1) which was at par with those of 'Pink Friendship', 'Arka Kesar', 'Poonam', 'H.S. 88-10-22' and 'H.S. 84-6-13' (Table 2). The earlier studies of Rao and Janakiram (2006) substantiated the present findings since the result of the present study reflected almost similar number of florets in the genotypes.

The number of marketable spikes per corm varied from 0.84 to 2.0 with a mean value of 1.4. Genotype '*Psittacinus* hybrid' (2.0), Hybrid selection 87-22-1 (1.9), Hybrid selection 88-4-8' (1.9), Hybrid selection 82-11-27' (1.9) and 'Kum Kum' (1.7) recorded the significant higher number of marketable spikes per corm while genotype *Gladiolus callianthus* (0.8), 'H.S. 84-4-9' (1.0), Pink Friendship (1.0) and Sapna (1.0) produced significantly lower number of marketable spikes per plant. Flowering duration varied from 7.2 days in 'H.S. 84-6-13' to 9.4 days in *Gladiolus callianthus* (Table 2). The number of spikes per corm in the present study ranged from 1.1 to 3.1, which nearly agrees with the range 1.0 to 2.8 spikes per corm in different exotic genotypes reported by Gupta *et al.* (2001).

Table 2: Genotypic performance on floral characteristics

Genotypes	Floret diameter (cm.)	Florets per spike (No)	Spikes per corm (No)	Marketable spike /corm (No)	Flowering duration (Days)
Aarti	9.2	13.3	2.0	1.4	8.0
Arka Kesar	10.8	18.1	1.3	1.1	7.4
Darshan	9.0	14.6	2.4	1.6	8.0
Dhiraj	8.8	16.6	1.7	1.5	7.2
Kum Kum	10.0	14.4	2.3	1.7	8.9
Pink Friendship	12.1	17.4	1.2	1.0	7.6
Poonam	10.4	16.5	1.4	1.1	7.6
Sapna	12.0	16.7	1.1	1.0	7.8
Shobha	11.1	17.7	1.7	1.5	8.5
Tilak	11.2	15.2	2.1	1.5	7.9
Hybrid sel. 82-11-27	9.1	14.7	2.2	1.9	8.6
Hybrid sel. 84-4-9	9.4	11.0	1.8	1.0	7.9
Hybrid sel. 84-6-13	9.6	14.6	1.6	1.2	7.2
Hybrid sel. 84-7-11	10.1	16.7	1.8	1.5	7.8
Hybrid sel. 86-32-11	11.1	13.0	1.9	1.5	7.9
Hybrid sel. 87-1-1	11.0	12.6	1.7	1.4	8.5
Hybrid sel. 87-22-1	10.1	15.6	2.5	1.9	9.0
Hybrid sel. 88-4-8	9.2	16.3	2.1	1.9	7.5
Hybrid sel. 88-10-22	10.4	13.5	1.4	1.3	9.2
<i>Gladiolus callianthus</i>	8.5	9.8	2.5	0.8	9.4
<i>Psittacinus</i> hybrid	8.2	13.0	3.1	2.0	8.3
Mean	10.1	14.8	1.9	1.4	8.1
F-test	**	**	**	**	**
CD @ 5%	0.663	1.091	0.487	0.343	0.741

\*\* Highly Significant Hybrid sel.=Hybrid selection

Spike weight varied from 31.7g to 117.2g with a mean value of 76.6g. Genotype 'H.S. 86-32-11' possessed the highest spike weight (117.2 g) followed insignificantly by Poonam (103.9 g) and Tilak (98.0 g). The genotype *Gladiolus callianthus* had the lowest spike weight (31.7 g) which, was inconsequential with those of H.S. 84-7-11 (32.7 g) and '*Psittacinus* hybrid' (48.8 g) (Table 3). Vase life varied from 6.17 days to

8.78 days with a mean value of 7.14 days. The longest vase life (8.8 days) of genotype 'H.S. 87-22-1' was at par with 'H.S. 82-11-27' (8.44 days). The shortest vase life exhibited by 'H.S. 88-4-8' (6.17 days) was inconsequential with 'Pink Friendship' (6.5 days) 'Poonam' (6.5 days), 'Darshan' (6.5 days), 'Tilak' (6.6 days), 'H.S. 84-6-13' (6.6 days) and 'H.S. 84-4-9' with 6.7 days (Table 3).

Table 3: Genotypic performance on spike weight and vase life

Genotypes	Spike weight (g)	Vase life (Days)
Aarti	58.77	7.00
Arka Kesar	94.55	6.77
Darshan	72.89	6.53
Dhiraj	78.78	6.94
Kum Kum	73.00	8.00
Pink Friendship	93.83	6.50
Poonam	103.88	6.50
Sapna	93.77	7.44
Shobha	75.33	7.11
Tilak	98.00	6.55
Hybrid selection 82-11-27	65.89	8.44
Hybrid selection 84-4-9	88.77	6.68
Hybrid selection 84-6-13	76.17	6.58
Hybrid selection 84-7-11	32.66	7.11
Hybrid selection 86-32-11	117.22	6.94
Hybrid selection 87-1-1	81.97	8.00
Hybrid selection 87-22-1	83.11	8.78
Hybrid selection 88-4-8	74.33	6.17
Hybrid selection 88-10-22	64.44	7.28
<i>Gladiolus callianthus</i>	31.72	7.47
<i>Psittacinus</i> hybrid	48.77	7.38
Mean	76.56	7.14
F-test	**	**
CD @t 1%	20.189	0.690

\*\* Highly significant

intervarietal and interspecific hybridization.

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'*Psittacinus* hybrid' was rated as the best one for the performances of the characters such as number of spikes per corm and number of marketable spikes per corm. Even though the longest flowering duration was in *Gladiolus callianthus* the genotype H.S. 87-22-1 was rated as superior in its vase life.

Evaluation of different genotypes of gladiolus for different vegetative and floral traits is indispensable to select desirable parents to utilize in hybridization. Genotypes, which possess desirable characters, viz., higher percent of sprouting, good quality of flower, more number of florets per spike, more number of marketable spikes per corm and long vase life can be selected for developing new cultivars. On the basis of desirable characters recorded in the present study, the promising genotypes need to be incorporated into the study of floral biology. Thereafter, they can be utilized in developing new hybrids through

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