

EVALUATION OF DIFFERENT GLADIOLUS CULTIVARS FOR GROWTH, FLOWERING, SPIKE YIELD AND CORM YIELD UNDER SAURASHTRA REGION OF GUJARAT

ANKIT CHOURASIA^{1*}, R. R. VIRADIA¹, H. ANSAR² AND SHUBHAM N MADLE¹

¹Department of Horticulture, Horticultural Instructional Farm, J. A. U., Junagadh - 362 001, INDIA

²College of Horticulture, U. H. S. Campus, G. K. V. K. Post, Bangalore - 560 065, INDIA

e-mail: ankit.chourasia98@gmail.com

KEYWORDS

Gladiolus genotypes
Growth
Flowering
Spike yield and Corm yield

Received on :

14.08.2014

Accepted on :

15.12.2014

*Corresponding author

ABSTRACT

The aim of the study was to find out the suitability of ten gladiolus varieties for cultivation under Saurashtra region of Gujarat in terms of growth, flowering, spike yield and corm yield characters during 2011-2012. The experiment was arranged in Randomized Block Design with three replications. There were significant difference among the varieties with respect to vegetative, floral and yield characters. Maximum plant height (122.87 cm) was recorded in 'Poppy Tear'. 'American Beauty' produced maximum number of leaves per plant (11.57). Red Majesty was recorded maximum leaf length (69.33 cm). 'White Prosperity' recorded maximum days to sprouting of corm (26.73), leaf width (4.60 cm), spike length (99.80 cm) and rachis length (67.80 cm). 'Red Beauty' required maximum, number of days to first spike emergence (114.40), diameter of daughter corm (3.37 cm), weight of daughter corm (61.01 g) and largest size index of daughter corm (11.51 cm²). 'Candiman' was recorded the maximum spike diameter (1.230 cm), floret neck diameter (1.97 cm), diameter of floret (15.50 cm), longest duration of flowering (24.00), number of florets per spike (23.73), number of spikes per plant (1.87), number of corms per plant (1.80), number of cormels produced per plant (98.00) and weight of the cormels (96.61). It was concluded that variety 'Candiman' was found best for cultivation under Saurashtra region of Gujarat in terms of growth, flowering, spike yield and corm yield characters.

INTRODUCTION

Gladiolus (*Gladiolus grandiflora* L.) is an herbaceous and one of the most cultivated, economically important and common flowering plants worldwide. The genus gladiolus is classified in the family Iridaceae and many species of this genus are found in South Africa, Tropical Africa, Madagascar and Eurasia. The current number of species in the genus is 255 (Goldblatt, and Manning, 1998). Gladiolus is known as queen of the bulbous plants is very popular as a cut flower, both with the consumer and the florist alike because of its many spike forms, colours and colour combinations, an advantage in every floral arrangement (Bushman, 1990). Modern Gladiolus an important cut flower, considered to have been bred originally from only six species (Lewis, et al., 1972). Gladiolus grows from corms, which consist of one or more buds. Once planted the buds on the corms develop into leaves and flowering spikes. At the same time as the leaves and spikes are extending, a new corm forms at the base of the leaves while at the union of the parent and daughter corm, stolons grow out, terminating in cormels which are used for propagation (Bushman, 1990). Ram, et al. (2005) evaluated the performance of 8 gladiolus cultivars, i.e. American beauty, Nova lux, White prosperity, Sylvia, Peter pears, Jester gold, and Picardy, under sodic soil conditions. White prosperity recorded the highest number of corms (1.79) and cormlets per plant (32.25). Rao and Janakiram (2006) studied on the performance of gladiolus cultivars and found that plant height, spike length and rachis

length were maximum in Dhiraj while Maximum floret size was recorded in Kumkum whereas the maximum number of florets per spike in Dhiraj. Kem et al. (2003) conducted an experiment and recommended Oscar and Melody for general cultivation similarly Kamble, et al. (2004) worked on the performance of gladiolus cultivars: Summer sunshine, Sylvia, Trust, Majic, Vendanapoli, American beauty, Melody, Snow white and Yellow cup. Shaukat et al. (2013) reported that spike length, field life of spike, number of florets per spike, corm and cormels production in Applause, Peter pears and Fidelio were recommended for cultivation. Das et al. (2014) worked on the performance of gladiolus cultivars: Aarti was found to be most promising followed by Suchitra among the 7 cultivars selected in terms of commercially important parameters like length of spike, rachis, number of florets/spike, vase life period, number of marketable spikes per plot and in hectare, number of corms and cormel production under rain fed situation of Assam. However, no research work has been done on performance of gladiolus varieties and expression of their genetic variability under Saurashtra region of Gujarat. The present study furnishes the results on assessment of gladiolus cultivars for growth, flowering, spike yield and corm yield under Saurashtra region of Gujarat.

MATERIALS AND METHODS

This experiment was conducted at Horticultural Instructional Farm, Dept. of Horticulture, JAU, Junagadh from October 2011

to April 2012 and arranged in Randomized Block Design with three replication. Gladiolus cultivars viz., Jester, American Beauty, White Prosperity, Candiman, Red Majesty, Charms Flow, Summer Sunshine, Poppy Tear, Pacifica and Red Beauty were selected for this study. The recommended agronomic packages and practice were followed to grow a crop. The soil being medium in NPK content, a basal dose of 1.5 kg of vermicompost per square meter was incorporated in the soil at the time of field preparation, in addition to this 300kg N, 150kg P₂O₅ and 150kg K₂O per hectare were applied accordingly. The entire dose of phosphorus and potash in form of single super phosphate (SSP), muriate of potash (MoP), respectively were applied just before planting of corms. The balance amount of nitrogen (other than that supplied by DAP (Di ammonium phosphate)) was applied through two top dressings of urea in equal amounts at 40 days after planting (at earthing up) and 60 days after planting (DAP). Planting of corms, two shallow furrows at 40 cm distance and of 6-8cm depth were prepared in each plot with help of kudali and treated corms (with Bavistin 0.2%) were planted at a distance of 20 cm in these furrows, on 24th October, 2011. Totally 25 corms of specific variety were planted in each plot (bed) following the specified planting distance of 40cm between rows and 20 cm between corms. The observations were recorded from randomly selected five plants in each treatment the data were analyzed statistically on various parameters viz., vegetative, flowering, spike yield and corm yield parameters.

RESULTS AND DISCUSSION

Growth parameter

The results obtained from present investigation on various parameters exhibited significant difference among cultivars are presented in Table.1. There were highly significant differences among the varieties for days to sprouting of corm. The maximum number of days taken for sprouting of corm was recorded in 'White Prosperity' (26.73 days) whereas the minimum (10.93 days) in 'Charms flow'. The variation in days to sprouting of corm amongst various varieties might be due to the genotypic differences that could have contributed to different hormonal levels, especially of gibberellins and abscisic acid in the corms, controlling the extent of dormancy and ultimately time required for sprouting. Variation in days to

corm sprouting in different genotypes have also been reported by Safiullah and Ahmed (2001) and Nair and Shiva (2003). Another probable reason for variation among the varieties might be the environmental conditions prevailed during sprouting period of corms that could have contributed to different genotype- environment interactions. Significantly maximum number of leaves per plant (11.57) was recorded in 'American Beauty' whereas the minimum number of leaves per plant (9.75) was recorded in 'Summer Sunshine' respectively. Similar findings amongst gladiolus varieties have also been reported by Kumar and Yadav (2005), Ram *et al.* (2005) and Swain *et al.* (2008). The variation in number of leaves per plant amongst the varieties might be due to variation amount of stored food material in mother corms expressed by their sizes. It could also be due to variation in rate of vegetative growth among the genotypes that could be attributed to their genetic makeup and could have been further influenced by the agro-climatic conditions. Similarly significant differences in plant height at all the stages of growth. The maximum plant height of 122.87 cm in 'Poppy Tear' and the minimum plant height of 92.00 cm in 'White Prosperity' respectively. Plant height is attributed to be an important varietal character that depends upon the genetic constitution. The variation in plant height among the various varieties might be due to genotypic differences in phenotypic expression of plant height and variations in different genotype-environmental interaction effects on plant height. It could have also been influenced by other plant characters viz., corm size, planting distance, etc. The results find support from reports of Saifullah and Ahmed (2001), Nagaraju and Parthasarthy (2001), Nair and Shiva (2003), Kumar and Yadav (2005) and Swain *et al.* (2008). Highly significant differences were showed by the varieties for leaf length. The maximum leaf length (69.33 cm) was recorded in 'Red Majesty' and the minimum (48.40 cm) in 'Pacifica' at all the stages. The findings are in line with those of Swaroop *et al.* (2005), Rani and Singh (2005) and Kumar and Yadav (2005). The maximum leaf width (4.60 cm) was recorded in 'White Prosperity', whereas the minimum leaf width (3.33 cm) noted in 'Pacifica'. The leaf width appeared to be positively correlated with corm size and weight indicating role of reserve food material of the mother corm on leaf width. The variation in leaf width among the varieties might be due to variation in their genetic constitution that could have lead to differential

Table 1: Sprouting and vegetative characters of gladiolus varieties

Varieties	Days taken for Sprouting of Corms	Number of Leaves per plant	Plant Height(cm)	Leaf length (cm)	Leaf width (cm)
Jester	19.13	10.4	99.33	54.47	3.97
American Beauty	13.93	11.57	109.87	51.93	3.69
White Prosperity	26.73	10.40	92.00	49.13	4.60
Candiman	12.73	10.80	114.53	64.07	4.40
Red Majesty	12.00	11.00	115.40	69.33	3.61
Charms Flow	10.93	10.80	114.93	66.27	4.05
Summer Sunshine	21.93	9.87	96.87	59.13	4.29
Poppy Tear	13.07	10.53	122.87	50.40	3.71
Pacifica	20.07	11.13	96.07	48.40	3.33
Red Beauty	26.40	10.50	100.80	53.07	3.88
Mean	17.69	10.70	106.267	56.62	3.95
S.Em. ±	0.97	0.27	4.33	4.05	0.23
C.D. at 5 %	2.89	0.80	12.89	12.04	0.69
C. V. %	9.53	4.41	7.07	12.41	10.21

Table 2: Floral characters of gladiolus varieties

Varieties	Days taken for first spike emergence	Spike length (cm)	Spike Diameter (cm)	Floret Neck Diameter (cm)	Diameter of Floret (cm)	Rachis Length (cm)	Duration of Flowering (days)	Number of floret per spike
Jester	88.87	92.40	0.93	1.16	10.01	59.47	20.33	15.07
American Beauty	65.2	58.00	0.96	1.73	12.47	43.00	19.33	15.13
White Prosperity	84.27	99.80	0.79	1.05	9.55	67.80	21.00	14.80
Candiman	66.67	83.53	1.23	1.97	15.50	61.33	24.00	23.73
Red Majesty	65.27	72.20	0.83	1.22	11.29	57.93	21.67	12.53
Charms Flow	62.00	82.80	0.70	1.19	10.47	57.47	19.33	15.40
Summer Sunshine	87.27	85.13	0.74	1.19	11.19	47.93	21.00	12.60
Poppy Tear	56.20	89.00	0.81	1.44	11.41	61.73	23.67	12.20
Pacifica	88.07	79.27	0.81	1.54	12.17	55.07	23.00	15.80
Red Beauty	114.40	91.13	0.95	1.13	8.85	56.33	21.00	14.87
Mean	77.82	83.33	0.88	1.36	11.29	56.81	21.43	15.21
S.Em. \pm	0.94	4.42	0.05	0.06	0.38	3.95	1.02	0.54
C.D. at 5 %	2.78	13.13	0.15	0.17	1.13	11.74	3.05	1.60
C. V. %	2.08	9.19	10.29	7.45	5.87	12.05	8.32	6.16

Table 3: Yield and corms characters of gladiolus varieties

Varieties	Spike yield per plant (Nos)	Corm yield per plant (Nos)	Diameter of corms (cm)	Weight of corms (g)	Number of Cormels per plant	Cormels weight (g) per plant	Size index of daughter corm
Jester	1.67	1.27	3.11	45.40	51.93	71.90	8.62
American Beauty	1.57	1.27	2.67	37.06	65.33	53.27	7.22
White Prosperity	1.63	1.53	2.57	36.03	63.27	55.29	6.97
Candiman	1.87	1.80	2.33	35.35	98.00	96.61	5.51
Red Majesty	1.57	1.33	2.55	32.95	61.33	51.89	6.15
Charms Flow	1.60	1.40	2.61	42.70	61.33	52.49	6.81
Summer Sunshine	1.60	1.13	2.52	35.06	61.33	62.53	6.43
Poppy Tear	1.57	1.73	2.54	40.05	60.07	58.06	6.67
Pacifica	1.70	1.40	2.62	43.25	62.13	81.55	7.32
Red Beauty	1.03	1.60	3.37	61.01	73.80	77.40	11.51
Mean	1.58	1.45	2.69	40.88	65.85	66.10	7.32
S.Em. \pm	0.11	0.13	0.08	2.58	5.88	2.63	0.50
C.D. at 5 %	0.33	0.39	0.25	7.68	17.46	7.83	1.48
C. V. %	12.33	15.87	5.53	10.96	15.46	6.91	11.85

rates of photosynthesis and ultimately variation in vegetative and reproductive growth of the plants. Variation in leaf width amongst gladiolus varieties has also been reported by Kumar and Yadav (2005).

Floral characters

The results revealed that highly significant differences in floral characters were presented in Table 2. The number of days to spike emergence were observed among the varieties that ranged from a maximum of 114.40 days in 'Red Beauty' to the minimum 56.20 days in 'Poppy Tear'. Time required for spike emergence is an important varietal character in gladiolus that might be primarily governed by the genetic makeup of the varieties. Spike emergence might have been primarily dependent on food reserves in plant that could be related to growth rate of plants regulating accumulation of the requisite level of carbohydrates for slipping. Similar results on varietal differences for spike emergence have reported by Nagaraju and Parthasarthy (2001) and Kumar and Yadav (2005). The spike length recorded maximum length (99.80 cm) in 'White Prosperity' and the minimum (58.00 cm) in 'American Beauty'. The results observed were in line with earlier findings of Kumar and Yadav (2005) and Swain *et al.* (2008). The variation in spike length could be due to differences among the varieties

for number of nodes and internodal length. The maximum diameter of spike (1.230 cm) observed in 'Candiman' and the minimum diameter of spikes (0.700 cm) recorded in 'Charms Flow', pointed out highly significant differences among the varieties for this character. The results observed were in line with earlier findings of Kamble (2001). The maximum floret-neck diameter (1.97cm) recorded in 'Candiman' and the minimum (1.05cm) noted in 'White Prosperity'. The floret-neck diameter appeared to be closely associated with floret diameter, the larger florets having correspondingly more floret-neck diameter and *vice versa*. The maximum diameter of floret (15.50cm) was recorded in 'Candiman' that was statistically superior over all other varieties while the minimum floret diameter (8.85 cm) was observed in 'Red Beauty'. The variation in floret diameter might be due to hereditary traits of different varieties. The results also find support from findings of Baweja and Brahma (2003) and Kumar and Yadav (2005). The maximum rachis length was recorded in 'White Prosperity' (67.80cm), whereas the minimum was recorded in 'American Beauty' (43.00cm). The results indicated that, rachis length was closely associated with other morphological characters like number of florets per spike, spike length and plant height in the varieties. Baweja and Brahma (2003), Kumar and Yadav

(2005) and Swain *et al.* (2008) also reported similar results. The longest duration of flowering (24.00 days) in 'Candiman' and the shortest (19.33 days) in 'Charms Flow'. The length of flowering period could be dependent upon carbohydrate reserve of the plants as blooming is an energy requiring process. The maximum number of florets (23.73) per spike was recorded in 'Candiman' while the minimum number of florets (12.20) was recorded in 'Poppy Tear'. The variation in number of florets per spike might be due to hereditary traits of the varieties. Similar results on floret number have been reported by Rani and Singh (2005) and Ram *et al.* (2005).

Yield characters

There were significant differences in yield characters among the varieties. The maximum number of spikes per plant (1.87) was recorded in 'Candiman' while the minimum number of spikes per plant (1.03) was observed in 'Red Beauty'. The variation in number of spikes per plant might be due to variability in genetic constitution of the varieties controlling the apical dominance and intensity of dormancy due to endogenous hormone level, governing the number of sprouts per planted corm. Similar results have also been reported by Safiullah and Ahmed (2001). The maximum number of 1.80 corms per plant was recorded in 'Candiman' while the minimum number of 1.13 corms was observed in 'Summer Sunshine'. It is general physiological property of gladiolus that every sprout emerging from the mother corm develops a new daughter corm at its base just above the mother corm. Similar results were reported by Safiullah and Ahmed (2001), Balamurugan *et al.* (2002) and Kem *et al.* (2003). The number of corms produced per plot and per hectare might have direct correlation with per plant production, as has been indicated by the results.

Corm characters

The results showed highly significant differences in corm characters among the varieties. The maximum diameter of corm (3.37cm) in 'Red Beauty' and the minimum (2.33cm) in 'Candiman'. Size of corm might be mainly governed by the genotypic makeup of the varieties determining the number of corms produced per plant, as the number of corms produced per plant appeared to be negatively correlated to corm diameter. It might be due to partitioning of the food material and its less availability for accumulation into individual corm. Similar, results on corm diameter have been reported by Kumar and Yadav (2005). The maximum weight of corm (61.01g) was noted in 'Red Beauty' whereas the minimum (32.95g) was recorded in 'Red Majesty'. Whereas the maximum number of 98.00 cormels per plant was recorded in 'Candiman' while the minimum number of 51.93 cormels per plant was observed in 'Jester'. The weight of corm and cormels per plants appeared to be associated with diameter of corm as evident from the results. It could be due to the fact that larger corms might have deposited more food resulting into their correspondingly heavier weight and vice versa. The results are in accordance with the finding of Kumar and Yadav (2005), Ram *et al.* (2005) and Bhujbal *et al.* (2013). The maximum weight of cormels produced per plant (96.61g) in 'Candiman' and the minimum (51.89g) in 'Red Majesty'. The weight of cormels produced per plant in various varieties was closely associated with the number of cormels produced per plant. Variation in size of cormels of different varieties of gladiolus has also been reported

by Kumar and Yadav (2005). The maximum size index of daughter corm was recorded in 'Red Beauty' (11.51cm) while the minimum was recorded in 'Candiman' (5.51cm). The variation in size index of daughter corms of different varieties might be due to the differences in diameter and thickness of corms that could be due to variations in their genetic setup leading to differential growth of corms in horizontal (diameter) or vertical (thickness) axis.

REFERENCES

- Balamurugan Rengaswamy, P and Arumugam, T. 2002.** Variability studies in gladiolus. *J. Orna. Hort.* **5(1):** 38-39.
- Baweja, H. S. and Brahma, B. 2003.** Performance of some gladiolus cultivar under mid hill conditions of Himachal Pradesh. *Sci. Hort.* **8:** 191-197.
- Bhujbal, G. B., Chavan, N. G. and Mehetre, S. S. 2013.** Evaluation of genetic variability heritability and genetic advances in gladiolus (*Gladiolus grandiflorus* L.) genotypes. *The Bioscan.* **8(4):** 1515-1520.
- Bushman, J. C. M. 1990.** Gladiolus as a cut flower in subtropical and tropical regions. *International Flower Bulb Center, Holland.*
- Das, R., Boro, A., Medhi, T. and Medhi, B. 2014.** Performance studies of some gladiolus cultivars under rain-fed condition of Assam (India). *Hort. Sci.* **89:** 789- 797.
- Goldblatt, P. and Manning, J. 1998.** Gladiolus in Southern Africa. *Vlaeberg: Fernwood Pres.*
- Kamble, B. S., Reddy, B. S., Gangadharappa, P. M and Kulkarni, B. S. 2004.** Evaluation of gladiolus varieties for quality parameters, flower and corm yields. *Haryana J. Hort. Sci.* **33(1/2):** 74-75.
- Kem, J. C., Yadav, S. K. and Kumar, S. 2003.** Performance of gladiolus cultivars under valley conditions of Uttaranchal. *Progressive Hort.* **35(1):** 108-110.
- Kumar, R. and Yadav, D. S. 2005.** Evaluation of gladiolus cultivars under subtropical hills of Meghalaya. *J. Orna. Hort.* **8(2):** 86-90.
- Lewis, G. J., Obermeyer, A. A and Barnard, T. T. 1972.** Gladiolus: a revision of the South African species. *J. South African Botany Suppl.*, p. 10.
- Nagaraju, V. and Parthasarthy, V. A. 2001.** Evaluation of gladiolus germplasm at midhills of Meghalaya. *Indian J. Hort.* **58(3):** 269-275.
- Nair, S. A. and Shiva, K. N. 2003.** Performance of selected gladiolus (*Gladiolus floribundas*) varieties under Bay island conditions. *Indian J. Agric. Sci.* **73(7):** 397-398.
- Ram, R. B, Tomar, K. S. and Datta, S. K. 2005.** Performance of certain gladiolus varieties under sodic conditions. *J. Orna. Hort.* **8(1):** 77-78.
- Rani, R. and Singh, C. 2005.** Evaluation of different gladiolus cultivars for quality flower production. *J. Res. Birsa Agric. Uni.* **17(2):** 227-230.
- Rao, T. M. and Janakiram, T. 2006.** Performance of exotic Orchidolus and I. I. H. R. gladiolus cultivars. *J. Orna. Hort.* **9(1):** 61-62.
- Safiullah and Ahmed, M. J. 2001.** Evaluation of exotic cultivar of gladiolus (*Gladiolus grandiflorus*) under Rawalkot conditions. *Sarhad J. Agric.* **7(2):** 171-174.
- Shaukat, S. A., Shah, S. Z. A., Shaukat, S. K. and Shoukat, S. W. 2013.** Performance of gladiolus (*Gladiolus grandiflora* L.) cultivars under the climatic conditions of bagh azad Jammu and Kashmir. *Pakistan J. Central European Agri.* **14(2):** 158-167.
- Swain, S. C., Rath, S. and Sethi, B. K. 2008.** Evaluation of gladiolus cultivars under valley conditions of Uttaranchal, *Orissa J. Hort.* **36(1):** 120-123.
- Swaroop, K., Singh, K. P. and Singh, K. P. 2005.** Performance of gladiolus under Delhi conditions. *J. Orna. Hort.* **8(1):** 32-35.