

Original Research Article

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Evaluation of *Gladiolus (Gladiolus hybridus Hort.)* Varieties for Vegetative and Floral Characters under Bundelkhand Conditions

Ajay Kumar Singh^{1*}, Rakesh Kumar¹, K. S. Tomar¹, Hitesh Kumar²,
Sanjeev Kumar³ and Amit Kumar²

¹Department of Floriculture and Landscape Architecture, College of Horticulture,
²Department of Genetics and Plant Breeding, College of Agriculture, ³Department of
Silviculture and Agroforestry, College of Forestry, Banda University of Agriculture and
Technology, Banda Uttar Pradesh-210001, India

*Corresponding author

ABSTRACT

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Fourteen varieties of gladiolus (*Gladiolus hybridus Hort.*) were evaluated for various vegetative and floral parameters under Bundelkhand conditions of Uttar Pradesh during the years 2017-18 and 2018-19. Minimum days to spike initiation were recorded in variety Jester (90.50 days) and variety White Prosperity took maximum days (108.05 days) for spike initiation. Plant height and spike length was recorded maximum in variety White Prosperity (124.25 cm and 110.65 cm) however, minimum plant height was recorded in variety Punjab Morning (84.22 cm), and minimum spike length was observed in variety Red White (65.07 cm). Maximum duration of flowering was exhibited by variety Willas Pink (18.61 days). However, minimum duration of flowering (13.28 days) was recorded in variety Peter Pears. Number of florets per spike was found maximum in cv. Willas Pink (19.95) and minimum number of florets per spike was found in cv. Red White (10.56). Maximum floret size was recorded by Willas Pink (9.66 cm) and minimum floret size was recorded in White prosperity (8.27 cm). Maximum vase life was recorded in cv. Black Star (10.22 days) and minimum in White Prosperity (6.95 days).

Introduction

Bulbous plants constitute one of the most important groups of plants grown for their floral wealth (Kumar *et al.*, 2011a). Among bulbous crops, gladiolus (*Gladiolus grandiflorus Hort.*), generally called glad (plural *gladioli*, gladioluses, glads) occupies a prime position among commercial cut flower

crops due to high demand in both domestic and international markets. It is called queen of bulbous flowers for its excellent aesthetic value and display life (Bhattacharjee and De, 2005).

It is also known as the Sword Lily or Corn Lily. It belongs to family iridaceae. Its fascinating spikes with variety of colours has

made it attractive for use in as cut flower, making bouquets, indoor decoration and in landscaping as herbaceous borders, bedding plant, in rockeries and pots.

Evaluation is the first important step in any crop improvement programme. It is the basic tool for assessing the genetic variability present in any crop species, which could be exploited for its commercialization. The purpose of evaluation is to ascertain its suitability to climate and soil of that particular area. So a particular crop and its varieties should be evaluated in a particular region before recommending to the farmers for cultivation on commercial level. In Bundelkhand region, no or very little work is done on gladiolus crop. As there is always a demand for novel types having attractive colours, uniform opening of florets, more number of florets per spike and more vase life along with high spike and corm yield. In view of this, a trial was conducted to evaluate the performance of various gladiolus varieties for morphological characters in bundelkhand region.

Materials and Methods

The present experiment was carried out at Experimental farm of Department of Floriculture and Landscape Architecture, Banda University of Agriculture and Technology, Banda, during 2017-18 and 2018-19. The experiment was laid out in a randomized block design with fourteen varieties as treatments with three replications.

The varieties studied in the experiment were Black Star, Peter Pears, Gold Star, Trader Horn, Pink Rose, White Prosperity, Red White, Novalux, Yellow Gold, Candyman, Willas Pink, Jester, Nathan Red and Punjab Morning. The corms were treated with carbendazim (0.2%) before planting in field. The corms were planted in beds at a spacing

of 30 x 20 cm. The recommended dose of fertilizer consisting of 30g N, 20g P₂O₅ and 20g K₂O per m² was applied in form of urea, single super phosphate and muriate of Potash, respectively. The P and K dose was applied in the beds one week before planting as per the treatment combination. Nitrogen was applied in two equal split doses. The first half dose was applied at 3-leaf stage and second half dose was applied at 6-leaf stage. All the recommended cultural operations i.e., irrigation, hoeing, weeding, spraying and fertilizer application was given in time during the entire crop period for obtaining better quality spikes along with high yield. Observations were recorded in five randomly selected plants in each treatment for various vegetative and floral parameters. The data were recorded for days taken to spike initiation, days taken to flowering, plant height (cm), spike length (cm), rachis length (cm), duration of flowering (days), number of florets open at one time, floret size (cm) and vase life (days). The mean value of the data observed was taken to represent a particular genotype with respect to character.

Results and Discussion

Analysis of variance revealed significant differences among the genotypes for most of the traits studied (Table 1) indicating presence of wider genetic variability, which can be utilized for genetic improvement of desired horticultural trait(s).

The mean performance of gladiolus cultivars varied considerably for vegetative and flowering parameters (Table 2). The perusal of data presented in revealed that minimum days to spike initiation were recorded in Jester (90.50 days) followed by Black Star (90.67 days), However, cv. White Prosperity took maximum days (108.05 days) for spike initiation followed by Pink Rose (106.17 days).

Earliest flowering was exhibited by cv. Black Star (105.00 days) followed by Jester (105.83 days) and cv. White Prosperity took maximum days to flowering (119.75 days). Late flowering was recorded in cultivar White Prosperity (119.75 days) followed by Pink Rose (117.67 days).

Variation in days taken to spike initiation and flowering might be due to genetic makeup of the cultivars, which might differ from cultivar to cultivar. It might also depend on food reserves in plant that could be related to growth rate of plants regulating accumulation of the requisite level of carbohydrates for slipping. The results are in conformity with the findings of Kadam *et al.*, 2014 and Chourasia *et al.*, 2015 in gladiolus.

The plant height and spike length (124.25 cm and 110.65 cm) was recorded maximum in cv. White Prosperity followed by Trader Horn (113.17 cm and 95.20 cm) and Willas Pink (111.18 cm and 94.48 cm), respectively. Whereas cv. Punjab Morning exhibited minimum plant height and spike length was recorded minimum in cv. Red white (65.07 cm). Cultivar Willas Pink exhibited maximum rachis length (61.51 cm) followed by White Prosperity (53.38 cm) and Black star (51.77 cm) and minimum rachis length (30.51 cm) was found in cv. Red White followed by cv. Punjab Morning (36.74 cm).

The variation in plant height, spike length and rachis length in different varieties may be due to influence of genetic and environmental factors. As each variety has its own characteristic genetic constitution, which contributes significantly to create variability. Similar observations for plant height, spike length and rachis length also reported by Mushtaq *et al.*, 2018; Singh *et al.*, 2017a and Singh *et al.*, 2017b in gladiolus and Kumar *et al.*, 2011b in snapdragon.

Duration of flowering was recorded maximum in cv. Willas Pink (18.61 days) and it is at par with cvs. Nathan Red (17.00 days), Black Star (16.84 days), Jester (16.78 days), Trader Horn (16.50 days), Yellow Gold (16.28 days), White Prosperity (16.23 days) and Gold Star (16.17 days). However, minimum duration of flowering (13.28 days) was found in cv. Peter Pears. The difference in flowering duration among the varieties might be due to difference in their genetic makeup as well as influence of environment and other management factors. Singh *et al.*, 2018 in gladiolus. Number of florets per spike was found maximum in cv. Willas Pink (19.95) followed by cv. Trader Horn (18.11) and White Prosperity (17.64). However, minimum number of florets per spike was recorded in cv. Red White (10.56) followed by Candyman (14.75). Number of florets differs from cultivar to cultivars, this might be due to hereditary traits of the cultivar of the gladiolus, which is governed by genetic makeup of the plants. Similar results on number of florets per spike have been reported by Rani and Singh (2005) in gladiolus. Maximum floret size was recorded by cv. Willas Pink (9.66 cm) and minimum floret size was recorded in cv. White prosperity (8.27 cm). Variation in floret size among the varieties might be due to differences in their genetic constitution. Similar results were also advocated by Pandey *et al.*, 2012; Rani and Singh (2005); Partap and Rao (2006) in gladiolus and Kumari and Misra (2009) in snapdragon.

Cultivar Jester showed maximum number of florets open at one time (7.61) followed by Candyman (7.36). However, minimum number of florets open at one time was found in cv. Black Star (5.28) followed by Nathan Red (5.34). This might be due to variation in genetic constitution among the varieties, which ultimately influences the number of florets opened at one time.

Table.1 Combined analysis of variance of 10 quantitative traits of fourteen genotypes of gladiolus (pooled data)

Source of variation	df	Mean sum of square									
		Days taken to spike initiation	Days taken to flowering	Plant height (cm)	Spike length (cm)	Rachis length (cm)	Duration of flowering	No. of florets per spike	Floret size (cm)	No. of florets open at one time	Vase life (days)
Replication(Within En)	4	44.67	17.26	99.81	126.80	81.73	7.21*	4.98	0.87	0.78	0.46
Year	1	13.31	0.06	0.19	4.38	76.50	0.90	5.34	0.00	0.44	0.64
Genotypes	13	187.91***	148.69***	806.92***	985.72***	368.77***	14.90***	27.39***	1.69***	2.84***	7.59***
Genotypes x year	13	8.75	8.96	19.17	27.96	15.56	0.93	0.80	0.12	0.44	1.00
Pooled Error	52	23.04	12.74	107.64	103.34	34.64	2.81	2.75	0.37	0.68	0.93

* Indicates significance at P=.05., ** Indicates significance at P=.01., *** Indicates significance at P=.001

Table.2 Mean performances of 14 gladiolus genotypes for different morphological characters (pooled data)

Sr. No.	Genotype	Days taken to spike initiation	Days taken to flowering	Plant height (cm)	Spike length (cm)	Rachis length (cm)	Duration of flowering	No. of florets per spike	Floret size (cm)	No of florets open at one time	Vase life (days)
1.	Black Star	90.67	105.00	102.02	80.10	51.77	16.84	17.06	9.09	5.28	10.22
2	Peter Pears	95.22	110.39	95.23	72.77	40.15	13.28	14.78	8.28	6.17	9.89
3.	Gold Star	95.61	109.28	90.63	75.15	40.32	16.17	16.34	8.36	6.50	10.05
4.	Trader Horn	93.17	106.34	113.17	95.20	50.92	16.50	18.11	9.43	5.61	8.89
5.	Pink Rose	106.17	117.67	95.44	80.14	47.15	15.89	17.14	8.31	6.51	8.11
6.	White Prosperity	108.05	119.75	124.25	110.65	53.38	16.23	17.64	8.27	6.17	6.95
7.	Red White	92.84	107.23	85.65	65.07	30.51	13.56	10.56	8.95	5.61	10.06
8.	Novalux	94.27	107.61	90.70	73.01	39.67	14.62	15.56	9.09	6.45	7.11
9.	Yellow Gold	93.56	107.17	97.46	74.75	42.07	16.28	16.95	9.13	6.61	9.89
10.	Candyman	95.22	106.22	89.15	70.48	43.81	13.61	14.75	9.50	7.36	8.33
11.	Willas Pink	103.86	116.69	111.18	94.48	61.51	18.61	19.95	9.66	6.56	8.22
12.	Jester	90.50	105.83	103.70	81.94	46.61	16.78	16.39	9.51	7.61	9.39
13.	Nathan Red	95.50	108.39	107.35	89.97	47.51	17.00	17.34	9.41	5.34	8.28
14.	Punjab Morning	92.84	106.17	84.22	66.08	36.74	14.22	16.45	8.35	6.61	9.94
	C.D. at 5%	7.23	5.29	16.17	15.69	9.16	2.67	2.39	0.94	1.17	1.23

Table.3 Pairwise mean comparison of important traits of the 14 genotypes of gladiolus (pooled data)

S. No.	Varieties	DSI	DTF	PH	SL	RL	DoF	NF/S	FS	NoFOT	VL
1	Black Star	90.61c	105.00c	102.02bcde	80.10bcd	51.77abc	16.83abc	17.05ab	9.09ab	5.28b	10.22a
2	Peter Pears	95.22bc	110.39bc	95.23bcde	72.77cd	40.14cdef	13.28d	14.78b	8.27b	6.17ab	9.89ab
3	Gold Star	95.61bc	109.28c	90.63cde	75.15bcd	40.32cdef	16.17abcd	16.33b	8.36b	6.50ab	10.05ab
4	Trader Horn	93.16c	106.34c	113.17ab	95.20ab	50.91abcd	16.50abcd	18.11ab	9.43ab	5.61b	8.89abc
5	Pink Rose	106.17a	117.67a	95.44bcde	80.13bcd	47.15bcde	15.89abcd	17.14ab	8.31b	6.50ab	8.11bc
6	White Prosperity	108.05a	119.75a	124.25a	110.65a	53.38ab	16.22abcd	17.64ab	8.27b	6.17ab	6.95c
7	Red White	92.84c	107.22c	85.65e	65.07d	30.50f	13.55cd	10.56c	8.94ab	5.61d	10.05ab
8	Novalux	94.22bc	107.61c	90.70cde	73.01cd	39.67def	14.61bcd	15.56b	9.10ab	6.45ab	7.11c
9	Yellow Gold	93.56c	107.17c	97.45bcde	74.75bcd	42.07bcdef	16.28abcd	16.94ab	9.13ab	6.61ab	9.89ab
10	Candyman	95.22bc	104.22c	89.15de	70.48cd	43.80bcde	13.61bcd	14.75b	9.49ab	7.36a	8.33abc
11	Willas Pink	103.86ab	116.69ab	111.18abc	94.48ab	61.51a	18.61a	19.95a	9.66a	6.56ab	8.22bc
12	Jester	90.56c	105.83c	103.69abcde	81.93bcd	46.61bcde	16.78abc	16.39b	9.51ab	7.61a	9.39ab
13	Nathan Red	95.50bc	108.39c	107.35abcd	89.97bc	47.51bcde	17.00ab	17.33ab	9.40ab	5.33b	8.28abc
14	Punjab Morning	92.84c	106.17c	84.22e	66.08d	36.74ef	14.22bcd	16.45b	8.35b	6.61ab	9.94ab

DSI = Days taken to spike initiation; DTF = Days taken to flowering; PH = Plant height; SL= Spike length; RL=Rachis length; DoF = Duration of flowering; NF/S = Number of florets per spike; FS = Floret size, NoFOT: Number of florets open at one time, VL=Vase life.

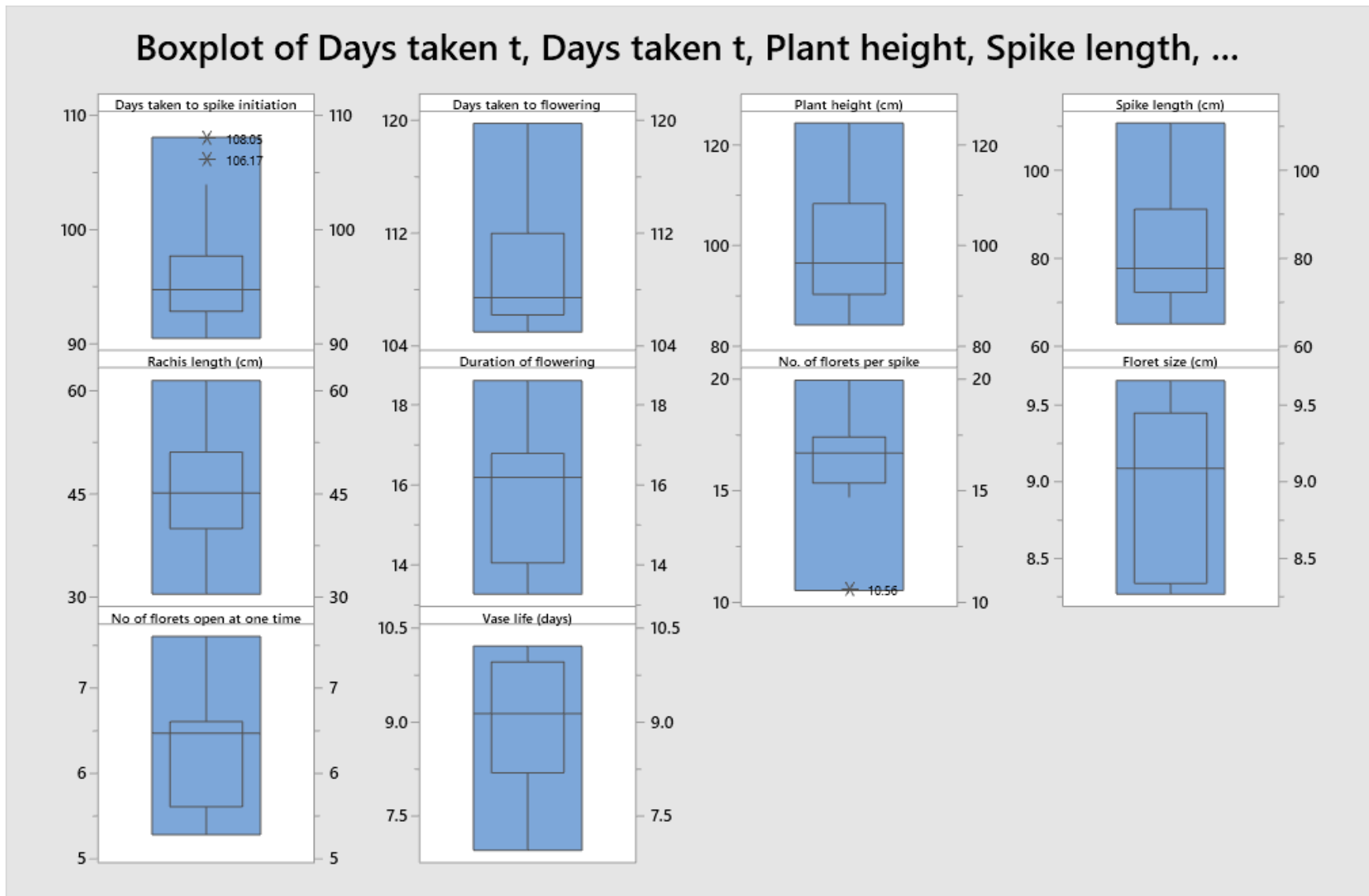


Fig.1 Box plots depicting variations for a) Days taken to spike initiation b) Days taken to 50% flowering, c) Plant height, d) Spike length e) Rachis Length f) Duration of flowering g) Number of florets per spike h) Floret size i) Number of florets open at one-time j) Vase life

The results are in conformity with the findings of Singh *et al.*, 2018 in gladiolus. Vase life studies indicated that cv. Black Star recorded maximum vase life (10.22 days) followed by Red White (10.06 days), whereas minimum vase life was recorded in White Prosperity (6.95 days) followed by Novalux (7.11 days).

The variation in vase life might be due to senescing behaviour by producing higher amount of ACC, ethylene forming enzyme and ethylene along with genetic makeup of different genotypes. It might also be due to carbohydrates reserves of flowers, osmotic concentration and pressure potential of petal cells which is influenced by genetic constitution. Vascular blockage might be regarded as the major cause for wilting leading to reduction in longevity of cut flowers.

The findings are in line with the results obtained by Jauhari and Singh (2006) in snapdragon and Laxmi *et al.*, (2008) in chrysanthemum. The pair wise mean comparison and basic descriptive statistics parameters of all traits of the experiment are presented in Table 3.

All genotypes are grouped for each trait using pairwise mean comparison analysis. The genotypes confirm distinct grouping pattern for each trait, where genotype with unique single letter are significantly different from another genotype and means with the same letter are not significantly different. The box plots depicting variability for all the traits are shown in Fig. 1.

Varieties White Prosperity, Traders Horn and Willas Pink exhibited better plant height and spike length and rachis length. Willas Pink also recorded maximum flowering duration, number of florets per spike and floret size. So, on the basis of above findings, these varieties

can be recommended for cut flower purpose to the farmers in this region.

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