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Performance of gladiolus genotypes for cut flower and corm production under high altitude of Uttarakhand

Pragya*, J.K. Ranjan, B.L. Attri, B. Das, Hare Krishna and N. Ahmed
Central Institute of Temperate Horticulture-Regional Station, Mukteshwar 263 138

ABSTRACT

An experiment was carried out during summer season of 2006-2008 at the experimental farm of CITH-RS, Mukteshwar (Uttarakhand) to evaluate the performance of 37 gladiolus cultivars for cut flower and corm production. The vegetative, flowering and corm and cormel characters showed significant differences among the cultivars under study. Cultivar Chantiler gave maximum plant height (147.33 cm), leaf length (60.00 cm) and leaf breadth (3.06 cm) while cultivar Novalux (62.33 and 69.33 days), Super Star (66.00and 73.67 days) and Red Beauty(69.00 and 76.33 days), Pusa Gunjan (70.33 and 77 days) and Pusa Shabnam (70.67 and 77.67 days) were found earliest for spike initiation and first floret showing colour, respectively. The longest spike was recorded in Pusa Jyotsana (88.67 cm), Novalux (88.33 cm), High Style (88.33 cm), Chantiler (86.33 cm), Pusa Dhanvantari (81.67 cm), Pusa Shabnam (80.33 cm), Summer Rose (83.33 cm) and Pusa Archana (83.33 cm) while the longest rachis was recorded in Chantiler (63.00 cm). Cultivar Pusa Jyotsana and Pusa Swarnima recorded maximum number of florets/spike (20.33). Significantly maximum corm equatorial diameter (6.14 cm), corm polar diameter (2.65 cm), corm weight (55.51g) and propagation co-efficient (330.90%) were observed in Legend and Chantiler. Looking into the performance of different cultivars, Pusa Jyotsana, Chantiler, Summer Rose, Pusa Shabnam, Novalux, High Style, Red Beauty and Snow Princess can be recommended for commercial cut flower production under higher hills of Uttarakhand while Chantiler, Legend and Sylvia could be taken up for quality corm and cormel production.

Key words: gladiolus, cut flower, kumaon hill, corm and cormels.

INTRODUCTION

Gladiolus (*Gladiolus* L., family: Iridaceae) is one of the important bulbous cut flowers in the cut flower industry. It occupies 8th position in the world cut flower trade and first in the domestic bulbous flower trade. In the northern plains, gladioli are grown during winter season but in hilly areas conditions are not congenial during Oct-March as the temperature goes down which will affect growth and flowering of gladiolus. However, climatic conditions of Kumaon hills offer quality flower production in gladiolus during summer season in open fields which gives an added advantage to the flower growers of hilly areas for marketing of gladiolus cut spikes to the plains as off-season crop, which in turn makes gladioli cultivation a remunerative business, particularly to the farmers of hilly areas. Identification of suitable cultivars is the prerequisite for successful cultivation of any crop. Very few reports are available on identification of suitable cultivars for hilly areas of our country (Dimri, 1; Lepcha *et al*., 5 and Kumar, 4), that too are for low and mid hills. However, higher hills remain unexploited for evaluation of gladiolus cultivars. The present investigation was, therefore, planned to evaluate the performance of different gladiolus cultivars for cut flower and corm production under Kumaon hill conditions of Uttarakhand.

*Corresponding authors E-Mail: ruchi_105@rediffmail.com

MATERIALS AND METHODS

During summer season of 2006-2008, 37 commercially important cultivars of gladiolus (Table 1) were evaluated under open field conditions. The experiment was laid out in a randomized block design (RBD) with three replications at the research farm of Central Institute of Temperate Horticulture-Regional Station, Mukteshwar (Uttarakhand) which is situated at 29^0 N latitude, 79^0 E longitude and 2200 m altitude. Mean maximum (21.8^0 C) and minimum (12.92^0 C) temperature and rainfall (119.111 mm) were recorded during the experimental period. Corms of different gladiolus cultivars were collected from IARI, New Delhi, GBPUAT, Pantnagar and Indo-Dutch Horticulture Technology Pvt. Ltd., Bhimtal. Healthy and uniform corms of 3-4 cm diameter

were planted in the first week of April at a spacing of 30x20 cm and 5 cm depth in the soil having sandy loam texture. Sixteen corms of each cultivar were planted in each replication and data were recorded from 5 randomly selected plants. Plot size was 1.00x1.00 cm^2 and 7 kg of well decomposed FYM was incorporated in each plot prior to planting. A basal fertilizer dose comprising 15:20:20::N:P:K per m2 and 15 g N at 4 leaf stage was applied. Uniform cultural practices were followed throughout the experiment. Spike length was measured with the help of metre scale from the juncture of third pair of leaf to the top most floret. Corms were harvested 60 days after harvesting of spikes. Diameter of corms was measured with the help of Digital Vernier callipers. Various growth, flowering and corm and cormel production parameters were recorded. Analysis of data was done by SPSS 13.0 software.

RESULTS AND DISCUSSION

The cultivars differed significantly for their vegetative and flowering characters (Table 1). Among the cultivars under study, Chantiler gave the tallest plant (147.33 cm)

Table 1. Growth and flowering characters of different cultivars of gladiolus under Kumaon hill conditions.

Sl. No	Genotype	Plant height (cm)	Leaves /plant	Leaf length (cm)	Leaf breadth (cm)	Days to heading	Days to first floret showing colour	Spike length (cm)	Rachis length (cm)	Florets/ spike
1	Pusa Gulaal	91.13	7.83	50.25	2.52	84.33	90.33	76.00	34.67	14.00
2	High Style	133.00	7.83	52.87	2.41	88.00	95.00	83.33	34.33	17.67
3	Novalux	109.97	7.87	55.21	2.65	62.33	69.33	88.33	49.67	15.67
4	Super Star	105.50	7.00	49.54	1.98	66.00	73.67	62.00	27.67	9.00
5	Summer Rose	116.60	6.33	54.21	2.52	86.00	92.67	83.33	30.67	17.33
6	Pusa Jyotsana	105.00	6.00	54.32	2.65	71.67	78.67	88.67	56.00	20.33
7	Legend	108.00	5.67	50.21	2.31	87.67	94.33	74.67	33.67	12.67
8	Snow Princess	105.70	5.67	50.41	2.41	77.00	83.33	73.00	51.00	15.00
9	Pusa Swarnima	108.00	7.00	50.41	2.75	84.33	91.00	72.33	56.00	19.00
10	Green Bay	102.33	5.67	50.74	2.45	90.33	97.33	73.00	33.67	15.67
11	Light Purple	107.67	6.67	52.33	2.74	72.00	77.67	73.00	51.00	15.67
12	Chantiler	147.33	6.00	60.00	3.06	81.00	89.00	86.33	63.00	15.00
13	Peter Pears	109.33	5.67	50.41	2.36	68.33	76.33	66.67	38.00	7.00
14	Apple Blossom	94.33	5.67	49.85	2.41	87.67	96.00	54.67	36.33	16.00
15	Pusa Shabnam	135.67	6.67	53.52	2.58	70.67	77.67	80.33	45.33	11.67
16	Puas Gunjan	105.53	6.33	54.21	2.59	70.33	77.00	77.00	40.33	10.67
17	Pusa Archana	92.00	5.00	52.41	2.65	90.33	96.33	83.33	42.00	10.67
18	Pusa Urmi	85.00	7.33	45.24	1.62	75.00	82.33	56.33	28.67	8.00
19	Sylvia	128.67	6.00	54.85	2.11	76.00	82.67	86.33	57.67	13.00
20	White Prosperity	96.67	5.00	50.74	2.41	86.67	93.00	61.00	36.67	9.00
21	Jackson V Gold	98.00	6.33	49.85	2.14	100.67	108.33	68.33	31.00	12.67
22	Sunset Sky	99.67	6.00	52.41	2.54	87.33	94.33	55.33	34.00	11.33
23	Pacifica	108.33	5.67	50.41	2.41	88.33	95.00	79.67	39.33	11.33
24	Punjab Morning	98.00	5.67	48.52	2.54	77.33	84.67	70.00	30.33	13.67
25	Pusa Dhanvantari	112.67	7.00	51.74	2.75	93.67	100.33	81.67	50.00	11.33
26	Vinks Glory	97.33	6.00	52.85	2.16	74.67	82.00	68.33	44.00	14.33
27	Red Majesty	100.67	5.00	54.54	2.54	87.00	93.00	67.00	41.33	14.00
28	Shubhangini	97.33	6.33	48.96	2.54	77.33	84.00	61.67	35.00	12.67
29	Jester	102.67	6.33	52.85	2.75	74.33	81.00	77.67	47.33	16.00
30	Red Ginger	109.67	6.00	54.11	2.54	84.67	91.67	71.00	44.33	15.33
31	American Beauty	112.67	7.00	52.12	2.33	74.67	81.67	70.33	29.67	11.33
32	Summer Pearl	97.33	5.33	49.74	2.11	87.00	95.00	72.33	30.33	11.33
33	Shobha	100.67	7.00	49.65	1.98	77.33	83.67	78.67	27.67	13.67
34	Happy End	97.33	3.67	50.33	1.97	74.33	82.33	70.00	30.33	11.33
35	Candyman	102.67	7.67	50.33	1.96	84.67	92.33	78.67	28.67	14.33
36	Ratna's Butterfly	109.67	6.00	49.85	2.65	84.67	90.67	70.00	31.00	14.33
37	Red Beauty	102.00	7.00	54.74	2.11	69.00	76.33	72.00	47.33	13.67
	CD at 5%	7.45	2.48	3.21	0.36	11.16	11.26	7.10	5.39	2.17

followed by Pusa Shabnam (135.67 cm) whereas Pusa Urmi gave shortest plant (85.00 cm). Chantiler gave the longest (60.00 cm) and broadest (3.06 cm) leaves whereas Pusa Urmi (45.24 and 1.62 cm) gave the shortest and the narrowest leaves respectively. Variations in vegetative characters may be due to their genetic make up as well as varietal differences.

Cultivar Novalux (62.33 and 69.33 days), Super Star (66.00 and 73.67 days) and Red Beauty (69.00 and 76.33 days), Pusa Gunjan (70.33 and 77 days) and Pusa Shabnam (70.67 and 77.67 days) were found earliest for spike initiation and first floret showing colour, respectively while Jackson Ville Gold (100.67 and 108.33 days), Pusa Archana (90.33 and 96.33 days) and Green Bay (90.33 and 97.33 days) were late in flowering. Similar variations in gladiolus cultivars have also been reported by Sheikh and John (6) and Kumar (4). Identification of such characters would be useful in prolonging the flowering duration. Judicious planting of early and late cultivars could be useful in sustainable marketing of gladiolus cultivars for a longer period.

The longest spike was recorded in Pusa Jyotsana

Table 2. Corm and cormel production of different cultivars of gladiolus under Kumaon hill conditions

Sl. No	Varieties	Corms/ mother corm	Equatorial corm diameter (cm)	Polar corm diameter (cm)	Corm weight (g)	Cormels/ plant	Cormels weight/ plant (g)	Propagation co-efficient (%)
1	Pusa Gulaal	1.00	4.4	1.68	27.00	2.20	0.67	138.35
2	High Style	1.00	5.52	2.34	42.67	8.33	2.00	223.35
3	Novalux	1.00	4.85	1.85	40.00	28.33	5.67	228.35
4	Super Star	2.00	4.74	1.65	29.00	36.67	7.07	180.35
5	Summer Rose	1.00	4.85	1.52	40.00	15.00	2.33	211.65
6	Pusa Jyotsana	1.50	5.52	1.98	29.00	21.67	3.67	163.35
7	Legend	1.67	6.14	2.65	55.51	35.33	10.67	330.90
8	Snow Princess	1.00	4.65	1.65	29.00	12.00	2.33	156.65
9	Pusa Swarnima	1.00	3.58	1.34	40.00	21.67	2.17	210.85
10	Green Bay	1.00	4.45	1.56	29.00	20.33	2.00	155.00
11	Light Purple	1.20	5.52	1.85	50.33	11.67	1.33	258.30
12	Chantiler	1.00	6.00	2.65	52.51	20.33	11.00	317.55
13	Peter Pears	1.00	4.74	1.72	46.33	15.67	2.00	241.65
14	Apple Blossom	1.00	4.65	1.86	47.33	2.33	0.67	240.00
15	Pusa Shabnam	1.00	5.23	1.99	46.33	19.67	2.00	241.65
16	Puas Gunjan	1.00	4.52	1.85	30.00	8.33	1.00	155.00
17	Pusa Archana	1.00	4.25	1.68	25.67	19.67	2.00	138.35
18	Pusa Urmi	1.00	3.07	1.22	11.33	1.80	0.50	59.15
19	Sylvia	1.00	5.54	2.28	42.33	39.33	20.00	311.65
20	White Prosperity	1.00	3.61	1.21	23.67	8.33	1.00	123.35
21	Jackson V Gold	1.00	3.23	1.25	22.33	19.67	2.00	121.65
22	Sunset Sky	1.00	3.57	1.52	24.00	8.33	1.00	125.00
23	Pacifica	1.00	4.24	1.26	24.67	19.67	2.00	133.35
24	Punjab Morning	1.00	4.17	1.58	21.00	8.33	1.00	110.00
25	Pusa Dhanvantari	1.00	3.56	1.36	29.33	19.67	2.00	156.65
26	Vinks Glory	1.00	3.85	1.45	24.33	8.33	1.33	128.30
27	Red Majesty	1.00	4.23	1.69	24.67	19.67	2.00	133.35
28	Shubhangini	1.00	3.24	1.52	21.00	8.33	1.67	113.35
29	Jester	1.00	3.89	1.52	29.33	19.67	2.00	156.65
30	Red Ginger	1.00	4.02	1.65	24.67	8.33	1.00	128.35
31	American Beauty	1.00	4.85	1.86	21.33	19.67	2.00	116.65
32	Summer Pearl	1.00	4.75	1.69	19.67	8.33	1.33	105.00
33	Shobha	1.00	4.69	1.65	20.67	8.33	1.00	108.35
34	Happy End	1.00	4.25	1.52	23.33	8.33	1.00	121.65
35	Candyman	1.00	4.07	1.54	22.33	8.33	1.00	116.65
36	Ratna's Butterfly	1.00	3.69	1.52	19.67	8.33	1.00	103.35
37	Red Beauty	1.00	4.85	1.69	29.33	21.67	2.67	160.00
	CD at 0.05	N.S.	0.44	0.30	6.30	4.90	1.01	17.24

(88.67 cm), Novalux (88.33 cm), High Style (88.33 cm), Chantiler (86.33 cm), Pusa Dhanvantari (81.67 cm), Pusa Shabnam (80.33 cm), Summer Rose (83.33 cm) and Pusa Archana (83.33 cm) whereas minimum in Pusa Urmi (56.33 cm) and Apple Blossom (54.67). However, the longest rachis was recorded in Chantiler (63.00 cm) followed by Pusa Jyotsana and Pusa Swarnima (56 cm) while the shortest rachis was observed in Super Star (27.67 cm), Shobha (27.67 cm) and Pusa Urmi (28.67 cm). Maximum number of florets/spike (20.33) was recorded in Pusa Jyotsana and Pusa Swarnima followed by High Style and Summer Rose (17.33) whereas minimum number of florets /spike (11.33) was observed in Summer Pearl, Happy End, Pusa Urmi, Shubhangini, Sunset Sky and Apple Blossom. Dimri (1) also noticed significant differences in floret number from different cultivars. The cultivars showing more than 16 florets thus can compete in the International cut flower trade of gladioli where minimum number of florets required for Fancy grade i.e. A grade is 16 as per the specification of North American Gladiolus Council (7). This opens a new avenue of export oriented floriculture for gladiolus growers of high altitude areas. The largest floret diameter (Fig. 1) was observed in Pusa Jyotsana (12.00 cm), High Style (11.67 cm) and Summer Rose (11.33 cm) followed by Green Bay (10.83 cm) whereas Super Star produced the smallest floret (5.67 cm). Longest vase-life (Fig. 2) was observed in Pusa Shabnam (9.67 days), Snow Princess (9.00 days), Summer Rose (9.67 days) and High Style (9.00 days).

Significant variation was observed in corm and cormel characters by different cultivars except for number of corms/mother corm, which was non-significant (table 2). The largest corm diameter (equatorial and polar) was recorded in Legend (6.14 and 2.65 cm) and Chantiler (6.0 and 2.65 cm) while Pusa Urmi recorded the smallest corm (3.07 and 1.22 cm). The corms harvested from different cultivars showed significant variation in their weight. The heaviest corm was produced by Legend (55.51 g) and Chantiler (52.51 g), whereas Pusa Urmi (11.33 g) and Ratna's Butterfly (19.67 g) produced the lightest corm. Dimri (1), Kumar and Yadav (3) also

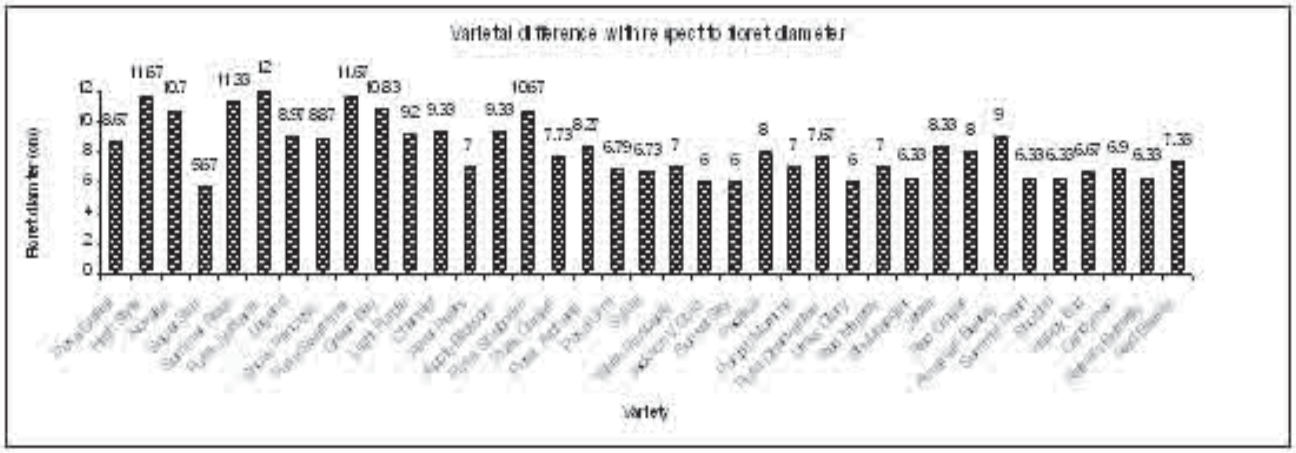

Fig. 1. Variation in floret diameter among 37 varieties of gladiolus under Kumaon hill conditions.

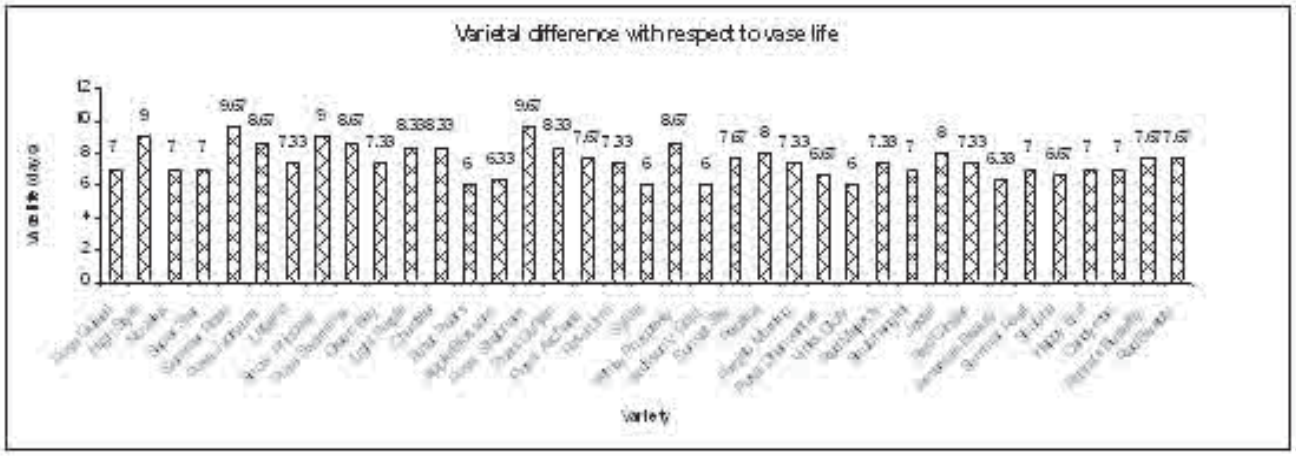

Fig. 2. Vase-life of 37 varieties of gladiolus under ambient conditions.

reported similar results on variation in weight of corms in different cultivars. Larger and heavier corms are suitable for producing quality spikes which lasts long.

Sylvia (39.33) and Super Star (36.67) recorded maximum number of cormels while weight of cormel per plant was found maximum in Sylvia (20.00). However, Pusa Urmi (1.8) and Pusa Gulaal (2.2) exhibited minimum number of cormels per plant. Kamble *et al*. (2) also reported wide variation in corm and cormel production while working on different cultivars of gladiolus. Due to wide differences in corm and cormel production by different genotypes, propagation co-efficient varied significantly which was maximum for Legend (330.90%), and Chantiler (317.55 %) followed by Sylvia (311.65%) whereas Pusa Urmi exhibited minimum propagation co-efficient (59.15%).

It is evident from the results that cultivar Novalux, Super Star, Red Beauty, Pusa Gunjan and Pusa Shabnam were early in flowering, while Jackson Ville Gold, Light Purple, Chantiler, Pusa Archana and Pusa Dhanvantari were late. Cultivar Pusa Jyotsana, Chantiler, Summer Rose, Pusa Shabnam, Novalux, High Style, Red Beauty and Snow Princess were found promising for production of quality spikes with a good durability, thus can be recommended for commercial cut flower production under higher hills of Uttarakhand during summer season. However, Chantiler, Legend and Sylvia could be taken up for quality corm and cormel production.

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