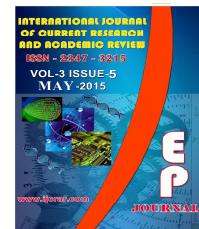




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### Effect of planting time on growth and flowering of Gladiolus

Tanya Thakur<sup>1</sup>, K. K. Dhatt<sup>2</sup> and Shahnawaz Ahmed<sup>3\*</sup>

<sup>1,2</sup>Dept of Floriculture and Landscaping, PAU Ludhiana 141004, India

<sup>3</sup>Division of Fruit Science, PAU Ludhiana 141004, India

*\*Corresponding author*

#### KEYWORDS

Gladiolus,  
Genotypes,  
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#### A B S T R A C T

The present study was conducted to investigate the effects of five environments i.e. 10<sup>th</sup> October, 25<sup>th</sup> October, 10<sup>th</sup> November, 25<sup>th</sup> November and 10<sup>th</sup> December, 2011 on growth and floral characters of twelve gladiolus genotypes. The minimum days to sprouting of corms (10.38 days) and longest spike length (81.20 cm) was recorded under 10<sup>th</sup> October. The floret size and number of florets per spike were maximum under 10<sup>th</sup> November planting (8.62 cm and 13.57). Among the genotypes, earliest sprouting was in cv. Punjab Glance (7.95days) and maximum spike length was recorded in cv. Punjab Flame (90.84 cm). Cultivar Red Advance gave the biggest florets (9.24 cm) and cv. Punjab Pink Elegance gave the highest florets count per spike (14.04). Hence, it was concluded that early planting from 10<sup>th</sup> October to 10<sup>th</sup> November gave better results with respect to growth and floral characters in all the gladiolus genotypes.

### Introduction

Gladiolus is an important bulbous crop which occupies important position among cut flowers in domestic as well as international market. The development and selection of suitable genotypes is an important factor that determines successful cultivation of gladiolus under different agro-climatic conditions. Phenotype in addition to the inherent make up is greatly influenced by environmental conditions as well as interaction between genotype and environment. In the plains of North India, quality spikes can be produced by planting suitable variety during September-

November (Arora and Khanna, 1985). Thus to evaluate a variety for early, mid and late planting season, this can be achieved either through suitable variety which can perform well on staggered planting or variety suitable for planting in different time of growing season.

### Materials and Methods

The present investigation was undertaken in the experiment farm area of Floriculture and Landscaping Department, Punjab

Agricultural University, Ludhiana, during 2011-2012. The experimental material comprised of 12 gladiolus genotypes viz. Punjab Flame, Punjab Pink Elegance, Punjab Glance, Punjab Lemon Delight, Sylvia, Suchitra, CPG, Jacksonville Gold, Red Advance, Red Beauty, Fidelio and Rose Supreme planted under five different planting times i.e. 10<sup>th</sup> October, 25<sup>th</sup> October, 10<sup>th</sup> November, 25<sup>th</sup> November and 10<sup>th</sup> December, 2011. The genotypes were sown as per Randomized Block Design (RBD) with three replications. Corms were planted at spacing of 30x20 cm with plot size of 2.4 m<sup>2</sup> and standard package were followed to raise the crop. For morphological analysis the genotypes were evaluated for 5 traits viz. days taken to sprouting of corms, days taken to flowering, spike length, number of florets per spike and floret size.

## **Result and Discussion**

### **Days taken to sprouting of corms**

Data presented in the Table 1 reveals the days taken to sprouting of corms by different genotypes under different environments.

Cultivar Punjab Glance was the earliest to sprout irrespective of planting dates. Under first planting on 10<sup>th</sup> October it took 5.60 days to sprout. Cultivar Punjab Flame followed by Jacksonville Gold took the maximum days to sprout (13.60 and 12.73 days) under first planting. Under second, third, fourth and fifth planting cv. Suchitra took longest time to sprout ranging from 14.96 to 19.00 days.

The twelve genotypes took 7.95 to 16.45 days to the sprouting of corms. Cultivar Punjab Glance took 7.95 days and was earliest to sprout followed by cv. Punjab

Pink Elegance (8.90 days). The maximum time was taken by cv. Suchitra (16.45 days) followed by Rose Supreme (14.47 days).

The results show that the genotypes took more time to sprout as the planting time was delayed. The days taken to sprouting of corms ranges from 10.57 to 14.74 days. The minimum time of 10.57 days was recorded in 10<sup>th</sup> October planting followed by third planting (13.03 days). These results are in close conformity with the findings of Saini *et al.* (1988) in which late sprouting was observed under delayed planting.

The time taken to sprouting of corms by twelve genotypes in five different environment ranges from 5.60 to 19.00 days. The minimum time was taken by cv. Punjab Glance (5.60 days) under first planting. Cultivar Suchitra took the longest time to sprout (19.00 days) under fifth planting.

The sprouting of corms presents significant variation due to genotype and planting time. Punjab Glance was earliest to sprout irrespective of planting dates as compared to other varieties. The variety Punjab Glance took minimum time to sprout in 1<sup>st</sup> planting (10<sup>th</sup> October) and also in last planting (10<sup>th</sup> December). In December planting it took 9.46 days and it was almost double than that of October planting. This indicates that sprouting of corms is affected by prevailing temperature at time of planting. It is pertinent to mention here that during October to November the average temperature ranges between 24.8-19.4 °C respectively which was optimum for corm sprouting (Arora and Sandhu, 1987). The results also show that varieties CPG and Punjab Flame were comparatively late under all plantings, which might be due to individual genetic makeup of the varieties. These results justify the findings of Sidhu (1989).

### **Days taken to flowering**

Data embodied in the Table 2 reveals that effect of genotypes, environment and genotype x environment interaction was significant with respect to days taken from planting to flowering.

The present study indicates that in October planting, cv. Punjab Glance took the minimum time to flowering (77.12 days) while in November and December planting cv. Rose Supreme took the minimum time to flowering ranging from 76.89 to 81.7 days. Punjab Flame, CPG, Punjab Lemon Delight were late to flower under all the environments.

The days taken to flowering ranges from 87.13 to 116.64 days in twelve gladiolus genotypes. The earliest flowering was reported in cv. Rose Supreme (87.13 days) followed by cv. Punjab Glance (89.34 days) and Suchitra (92.71 days). The longest time to flower was taken by cv. Punjab Flame (116.64 days) followed by cv. Sylvia (115.97 days).

In present investigation, under different planting times, the time taken to flowering ranges from 97.30 days to 108.27 days. The earliest flowering was reported in December planting which took 97.30 days followed by 10<sup>th</sup> October planting. The genotypes took maximum time to flower under 25<sup>th</sup> October planting (108.27 days). The time taken to flowering in twelve genotypes under different environments ranges from 77.12 to 128.46 days. Dod *et al.* (1989) reported that under late planting emergence of spike was observed earlier.

The earliest flowering was reported in cv. Punjab Glance (77.12 days) under 10<sup>th</sup> October planting followed by Rose Supreme (76.89 days) under 25<sup>th</sup> November planting. The maximum time was taken by cv. Punjab

Flame under 10<sup>th</sup> October planting followed by 25<sup>th</sup> October planting (128.46 and 125.46 days respectively).

### **Spike length**

Data embodied in Table 3 indicates that there was significant effect of genotypes, environments and genotype environments interaction on spike length.

The results indicate that cv. Punjab Flame followed by Punjab Pink Elegance produced the longest spike under all the planting times. Cultivar Rose Supreme recorded the minimum spike length under all plantings ranging from 59.34 to 74.99 cm.

The spike length ranges from 66.30 to 90.84 cm in twelve genotypes of gladiolus. The maximum was recorded in cv. Punjab Flame (90.84 cm) and the shortest spike was reported in cv. Fidelio (66.30 cm).

The spike length ranges from 65.95 to 81.20 cm under different planting times. The longest spike was recorded under 10<sup>th</sup> October planting and the spike length reduced as planting time was delayed. The minimum length was recorded under 10<sup>th</sup> December planting. Nijasure and Ranpise (2005) also reported that planting of gladiolus corms on 15 October was optimum for better flower in terms of spike length.

The spike length of twelve genotypes under five different plantings ranges from 60.44 to 100.35 cm. The maximum was reported in cv. Punjab Flame (100.35 cm) under 10<sup>th</sup> October planting followed by 25<sup>th</sup> October planting. The shortest spike was reported in cv. Fidelio (60.44 cm) under 10<sup>th</sup> December planting.

In the present studies it has been observed that planting time significantly influenced the spike length. The spike length increased

under October planting and decreased significantly under December planting. The better spike length may be attributed to the prevalence of favourable environmental conditions at time of planting from October to November, when the maximum and minimum temperature is around 32.1 °C and 12.5 °C respectively. The plant develops better root system and luxuriant growth by quantities of photosynthates under favourable conditions whereas, in late planting, plant establishment and growth is poor due to low temperature in December. However, the present experiment also presents a wide range of variation for spike length among the varieties. Such a wide variation for this character is mainly due to genetic nature confirming the earlier reports in gladiolus (Singh *et al.*, 2000).

#### **Floret size**

Data presented in the Table 4 reveals that effect of genotypes, environment and genotype x environment interaction was significant with respect to floret size.

The results indicated that under first planting the maximum floret size was recorded in cv. Punjab Glance (9.31 cm). Cultivar Red Beauty (9.38 cm) produced the biggest florets under second planting followed by cv. Suchitra (8.69 cm). Cultivar Red Advance produced the biggest florets under November and December plantings ranging from 9.51 to 9.83 cm. The smallest florets were produced by cv. Jacksonville Gold under October to November plantings ranging from 6.88 to 7.67 cm. Cultivar Fidelio under 10<sup>th</sup> December planting produced smallest florets (7.41 cm).

The floret size in twelve genotypes ranges from 7.51 to 9.24 cm. The biggest floret was recorded in cv. Red Advance (9.24 cm) which is at par with cv. Red Beauty (9.05 cm) and Punjab Glance (8.85 cm). The

minimum floret size was in cv. Jacksonville Gold (7.51 cm) which is at par with cv. Sylvia (7.94 cm). Pasannavar (1994) also recorded minimum floret diameter in cv. Sylvia.

The floret size ranges from 8.11 to 8.62 cm in five different environments. The maximum floret size was observed in first planting (8.62 cm) which is at par with fourth planting (8.44 cm). The florets size decreased under late planting time. Arora and Sandhu (1987) reported bigger floret size under late planting of 1<sup>st</sup> November. The floret size ranges from 6.88 to 9.83 cm in twelve genotypes under five different environments. Cultivar Red Advance produced the biggest florets under fourth planting (9.83 cm). The smallest florets were produced by cv. Jacksonville Gold under second planting (6.88 cm).

In the present investigation it was observed that var. Red Beauty and Red Advance produced the bigger florets irrespective of planting time. There were no significant differences during first three plantings i.e. 10<sup>th</sup> October to November, but the floret size reduced significantly as the planting was delayed beyond 25<sup>th</sup> November. The difference for florets size under late plantings was non-significantly lower than earlier plantings.

In this experiment cv. Sylvia and Jacksonville Gold gave the smaller florets. This variation of size in different varieties might be due to genetic contribution of varieties under observation.

#### **Number of florets per spike**

Data presented in Table 5 revealed that there was significant difference due to genotypes, environment and genotype environment interaction exhibited significant differences for number of florets per spike.

**Table.1** Effect of genotype and planting time on days taken to sprouting of corms

Genotypes	Planting time					
	10 Oct	25 Oct	10 Nov	25 Nov	10 Dec	Mean
<b>CPG</b>	12.00	13.00	13.66	15.23	15.93	13.96
<b>Fidelio</b>	10.26	11.00	12.93	16.00	16.93	13.42
<b>Punjab Lemon Delight</b>	10.20	10.46	12.00	12.26	13.46	11.68
<b>Punjab Flame</b>	13.60	13.73	13.13	13.60	15.33	13.88
<b>Red Beauty</b>	9.73	10.53	12.06	12.80	13.13	11.65
<b>Punjab Pink Elegance</b>	7.00	7.93	9.06	9.86	10.66	8.90
<b>Sylvia</b>	11.20	12.80	13.73	16.20	16.66	14.12
<b>Punjab Glance</b>	5.60	6.93	8.63	9.13	9.46	7.95
<b>Red Advance</b>	12.46	14.93	14.56	14.60	14.93	14.30
<b>Jacksonville Gold</b>	12.73	12.93	12.53	14.13	14.46	13.36
<b>Rose Supreme</b>	11.12	12.26	15.80	16.20	17.00	14.47
<b>Suchitra</b>	11.02	14.96	18.33	18.93	19.00	16.45
<b>Mean</b>	10.57	11.78	13.03	14.07	14.74	—

C.D. (P = 0.05) Genotype = 0.56; Environment= 0.36; G x E Interaction= 1.2

**Table.2** Effect of genotype and planting time on days taken to flowering

Genotypes	Planting time					
	10 Oct	25 Oct	10 Nov	25 Nov	10 Dec	Mean
<b>CPG</b>	110.73	118.53	117.6	117.73	109.73	114.86
<b>Fidelio</b>	97.86	106.06	110.4	122.66	123.33	112.06
<b>Punjab Lemon Delight</b>	91.59	101	107.16	103.06	96.15	99.79
<b>Punjab Flame</b>	128.46	125.46	112.26	108.99	108.05	116.64
<b>Red Beauty</b>	92.59	108.59	109.59	104.8	93.35	101.78
<b>Punjab Pink Elegance</b>	81.6	99.66	103.33	104	89.93	95.70
<b>Sylvia</b>	112.8	116.19	118.4	120.40	112.04	115.97
<b>Punjab Glance</b>	77.12	93.73	99.06	92.13	84.66	89.34
<b>Red Advance</b>	109.39	122.54	118.46	109.33	104.72	112.89
<b>Jacksonville Gold</b>	113.93	115.6	109.29	111.92	103.79	110.91
<b>Rose Supreme</b>	101.99	97	81.7	76.89	78.06	87.13
<b>Suchitra</b>	101.39	94.93	95.62	87.24	84.38	92.71
<b>Mean</b>	101.62	108.27	106.91	104.93	97.30	-

**Table.3** Effect of genotypes and planting time on spike length (cm)

Genotypes	Environment					
	10 Oct	25 Oct	10 Nov	25 Nov	10 Dec	Mean
<b>CPG</b>	76.98	75.45	66.45	62.35	61.78	68.60
<b>Fidelio</b>	76.46	74.87	64.88	61.89	60.44	67.71
<b>Punjab Lemon Delight</b>	84.36	83.88	74.35	71.23	70.89	76.94
<b>Punjab Flame</b>	100.35	97.68	88.48	84.19	83.52	90.84
<b>Red Beauty</b>	82.55	80.98	70.45	65.47	64.33	72.76
<b>Punjab Pink Elegance</b>	85.66	84.98	75.58	71.99	70.42	77.73
<b>Sylvia</b>	76.34	75.47	66.54	62.39	61.99	68.55
<b>Punjab Glance</b>	82.67	81.88	73.45	70.98	69.34	75.66
<b>Red Advance</b>	74.99	73.41	64.73	60.89	59.45	66.69
<b>Jacksonville Gold</b>	75.64	75.02	66.56	63.98	62.35	68.71
<b>Rose Supreme</b>	74.99	73.23	63.44	60.49	59.34	66.30
<b>Suchitra</b>	83.45	82.88	72.98	68.78	67.66	75.15
<b>Mean</b>	81.20	79.97	70.65	67.05	65.95	

C.D (P = 0.05)      Genotype = 4.49;      Environment = 2.90;      G x E Interaction = 10.05

**Table.4** Effect of genotype and planting time on floret size (cm)

Genotypes	Planting time					
	10 Oct	25 Oct	10 Nov	25 Nov	10 Dec	Mean
<b>CPG</b>	8.18	8.08	8.63	8.23	8.21	8.27
<b>Fidelio</b>	8.20	8.43	9.33	9.66	7.41	8.61
<b>Punjab Lemon Delight</b>	7.88	7.98	8.37	8.31	8.43	8.19
<b>Punjab Flame</b>	8.45	7.33	8.41	8.40	7.88	8.09
<b>Red Beauty</b>	8.71	9.38	9.50	8.75	8.91	9.05
<b>Punjab Pink Elegance</b>	8.48	7.96	8.58	7.85	8.78	8.33
<b>Sylvia</b>	7.83	7.91	8.26	7.68	8.00	7.94
<b>Punjab Glance</b>	9.31	8.66	8.91	8.70	8.65	8.85
<b>Red Advance</b>	9.28	7.81	9.79	9.83	9.51	9.24
<b>Jacksonville Gold</b>	7.10	6.88	7.25	7.67	8.69	7.51
<b>Rose Supreme</b>	8.34	8.23	8.31	8.21	8.09	8.24
<b>Suchitra</b>	8.65	8.69	8.08	8.00	7.90	8.26
<b>Mean</b>	8.37	8.11	8.62	8.44	8.37	—

C.D. (P = 0.05)      Genotype = 0.4;      Environment = 0.27;      G x E Interaction = 0.96



**Table.5** Effect of genotypes and planting time on number of florets per spike

Genotypes	Planting time					
	10 Oct	25 Oct	10 Nov	25 Nov	10 Dec	Mean
<b>CPG</b>	9.66	11.40	14.86	14.80	14.80	13.10
<b>Fidelio</b>	10.20	10.66	12.66	9.66	7.33	10.10
<b>Punjab Lemon Delight</b>	8.86	11.26	11.33	9.06	7.38	9.58
<b>Punjab Flame</b>	16.00	15.00	14.00	13.23	13.00	14.24
<b>Red Beauty</b>	12.66	14.53	16.40	13.73	12.63	13.99
<b>Punjab Pink Elegance</b>	15.46	16.13	14.60	11.46	12.53	14.04
<b>Sylvia</b>	12.00	10.20	12.80	12.33	13.80	12.22
<b>Punjab Glance</b>	10.20	11.60	13.60	12.53	12.74	12.13
<b>Red Advance</b>	12.93	12.06	14.40	14.00	11.33	12.94
<b>Jacksonville Gold</b>	8.00	11.26	12.06	7.07	8.22	9.32
<b>Rose Supreme</b>	12.45	13.26	14.33	11.20	11.88	12.62
<b>Suchitra</b>	11.51	11.96	14.63	12.23	11.90	12.44
<b>Mean</b>	11.66	12.44	13.80	11.77	11.46	—

C.D. (P = 0.05)      Genotype = 0.88;      Environment = 0.57;      G x E Interaction = 1.97

The results show that the cv. Punjab Pink Elegance produced the maximum number of florets under 10<sup>th</sup> October and 25<sup>th</sup> October planting (15.46 and 16.13 respectively). Under 10<sup>th</sup> November planting cv. Red Beauty (16.40) produced maximum florets per spike which is at par with cv. CPG (14.86). Cultivar CPG produced maximum florets under 25<sup>th</sup> November and 10<sup>th</sup> December planting (14.80 and 14.80 respectively). The minimum numbers of florets were produced in cv. Jacksonville Gold under 10<sup>th</sup> October and 25<sup>th</sup> November planting (8.00 and 7.07 respectively). Cultivar Punjab Flame produced minimum number of florets under 10<sup>th</sup> November and 10<sup>th</sup> December planting (11.26 and 6.83 respectively).

The number of florets in twelve genotypes ranges from 9.32 to 14.04. Cultivar Punjab Pink Elegance showed the highest number of florets (14.04) which is at par with cv. Red Beauty (13.99). The lowest numbers of

florets were in cv. Jacksonville Gold (9.32) which is at par with cv. Punjab Lemon Delight (9.58).

The result indicates that the number of florets ranges from 10.94 to 13.57 under different environments. The maximum number of florets was recorded under 10<sup>th</sup> November planting (13.57) which differs significantly from 10<sup>th</sup> October planting (12.09). Last planting on 10<sup>th</sup> December produced minimum number of florets per (10.94/spike). Arora and Sandhu (1987) reported more number of florets under late planting (1<sup>st</sup> November planting) than in early planting.

The result of interaction shows that the number of florets in twelve genotypes under five environment ranges from 6.83 to 16.40. Cultivar Red Beauty produced highest number of florets under 25<sup>th</sup> November planting (16.40) followed by cv. Punjab Pink Elegance under 25<sup>th</sup> October planting

(16.13). The lowest number of florets was recorded in cv. Punjab Flame under 10<sup>th</sup> December planting (6.83).

The results show that variety Punjab Flame, Punjab Pink Elegance and Red Beauty were the best varieties in terms of florets count per spike. As the floral parameters in term of spike length, rachis length and florets per spike are related with plant height. The more number of florets on a spike are obtained from the varieties which were taller and having longest spike. In the present study it was observed that Punjab Lemon Delight, Fidelio and Jacksonville Gold gave the lowest floret counts under December planting. While we compare the results for this parameter, it was observed that floret number reduced significantly in December planting as compared with October and November planting. This might be due to the reduced plant height and spike length under late plantings. These results are in close conformity with the findings of Saini *et al* (1988) and Sidhu (1989).

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