

## Genetic variability, heritability, genetic advance, correlation coefficient and path analysis in gladiolus

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### ABSTRACT

The present investigation was carried out to assess the extent of genetic variability, heritability, genetic advance, correlation coefficient and path analysis in 12 gladiolus genotypes, *i.e.*, True Love, Pacifica, Rigency, Yellow Stone, Sagun, Tiger Flame, Praha, Snow Princess, Picardy, Eurovision, Aldebran and Promise. The experiment was laid out in Randomized Block Design with three replications. The row to row and plant to plant spacings were maintained at 30 cm × 25 cm, respectively. From the analysis of data, it can be concluded that the maximum weight of corms per plot was recorded in Rigency followed by Picardy and Tiger Flame. Maximum phenotypic variation was noted for corm weight per plant (180.75) followed by number of days taken full spike emergence (117.18). Positive correlation was recorded corm weight plot with corm size (0.906), spike length (0.764), plant height (0.669).

**Key words:** Variability, heritability, genetic advance, correlation and path analysis.

### INTRODUCTION

Gladiolus (*Gladiolus* sp. L.) belongs to the family Iridaceae and native of Africa and Asia minor. It is a leading cut flower of India as well as world. Gladiolus is very much liked for its majestic spikes which contain attractive, elegant and delicate florets. These florets open in sequence over longer duration and hence has a good keeping quality of cut spikes. These spikes of gladiolus are mainly used for garden and interior decoration and for making bouquets. Gladiolus occupies first place in terms of return as compared to other cut flower. The extent of genetic variability is of paramount importance for the improvement of a crop as greater is the genetic variability in the existing germplasm better would be the chance of selecting superior genotypes.

### MATERIALS AND METHODS

The present experiment was carried out at the Horticulture Research Farm, Department of Applied Plant Science (Horticulture), B.B.A.U., Lucknow during October to April 2009-10. The experiment was laid out in Randomized Block Design with three replications. The row to row and plant to plant spacing were maintained at 30 cm × 25 cm, respectively. The twelve gladiolus genotypes are True Love, Pacifica, Rigency, Yellow Stone, Sagun, Tiger Flame, Praha, Snow Princess, Picardy, Eurovision, Aldebran and Promise were selected for experiment. The

observations were recorded on 19 characters, *viz.*, plant height (cm), number of days taken for spike initiation, number of days taken for full emergence of spike, number of days taken for first floret to show colour, spike length (cm) spike weight (g), number of days taken for harvesting, number of corms per plant, weight of corms per plant (g), size of corms per plant (cm) and weight of corms per plot (kg). The analysis of variance was done. Variability for different quantitative characters was estimated as suggested by Burton and De Vane (2). Heritability and expected genetic advance also was calculated following standard procedures.

### RESULTS AND DISCUSSION

The coefficient of variation, GCV, PCV, heritability and genetic advance for twelve characters of gladiolus are presented in Table 1. The data of experiment showed that the maximum plant height was recorded in Picardy (77.53 cm) and minimum in yellow stone (57.88 cm). The maximum number of days taken for spike initiation was recorded in Pacifica (88.83 days) and minimum in Snow Princess (57.33 days). The maximum number of days taken for full spike emergence in Sagun (92.91 days) and minimum in Snow Princess (62.75 days). The maximum number of days taken for first floret to open was in Pacifica (95.75 days) and minimum in Snow Princess (75.91 days). The maximum number of days taken for first floret to show colour was noted in Pacifica (95.91 days) and minimum in snow princess (67.91 days).

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**Table 1.** Estimation of range, genotypic coefficient of variance (GCV), phenotypic coefficient of variance (PCV), heritability and genetic advance for 12 characters in gladiolus.

Character	Range		Phenotypic variation	Genotypic variation	PCV (%)	GCV (%)	Heritability (%)	Genetic advance
	Min.	Max.						
Plant height (cm)	57.88 (Yellow Stone)	77.53 (Picardy)	33.82	33.66	8.86	8.88	99.50	15.28
No. of days taken for Spike initiation	57.33 (Snow Princess)	88.83 (Pacifica)	98.27	98.19	13.64	13.64	99.10	26.15
No. of days taken for full spike emergence	62.75 (Snow Princess)	92.91 (Sagun)	117.18	117.04	13.93	13.94	99.00	28.54
No. of days taken for 1 <sup>st</sup> floret to open	75.91 (Snow Princess)	95.75 (Pacifica)	53.84	53.76	8.59	8.59	99.20	19.34
No. of days taken for 1 <sup>st</sup> floret to show colour	67.91 (Snow Princess)	95.91 (Pacifica)	100.08	99.95	11.76	11.77	99.40	26.37
Spike length (cm)	54.73 (Rigency)	88.88 (Eurovision)	014.37	104.27	14.47	14.48	99.30	26.94
Spike weight (g)	50.66 (Aldebran)	75.94 (Snow Princess)	51.54	50.45	11.13	11.14	99.00	18.92
Days for harvesting	72.58 (Snow Princess)	102.75 (Sagun)	93.36	93.30	10.57	10.57	99.00	25.49
No. of corms/ plant	1.23 (Praha)	2.05 (Rigency)	0.371	0.060	15.55	38.48	16.00	0.26
Weight of corms/ plant (g)	57.69 (Eurovision)	107.08 (Rigency)	180.75	180.48	18.12	18.13	99.00	35.44
Size of corms/ plant (cm)	3.93 (True Love)	7.46 (Rigency)	1.52	1.42	22.05	22.79	93.00	3.04
Weight of corms/plot (kg)	0.51 (Eurovision)	0.96 (Rigency)	0.014	0.014	18.16	18.24	99.00	0.31

The maximum spike length was recorded in Eurovision (88.8 cm) and minimum in Rigency (54.73 cm). The maximum spike weight was recorded in Snow Princess (75.94 g) and minimum in Aldebran (50.66 g). The maximum number of days for harvesting was recorded in Sagun (102.75 days) and minimum in Snow Princess (72.58 days). The maximum number of corms per plant was recorded in Rigency (2.50) and minimum was recorded in Praha (1.23). The maximum weight of corms per plant was recorded in Rigency (107.08 g) and minimum in Eurovision (57.69 g). The maximum corm size was recorded in Rigency (7.46 cm) and minimum was recorded in True Love (3.93 cm) and maximum weight of corms per plot was recorded in Rigency (0.960 kg) and minimum in Eurovision (0.510 kg).

The perusal of data revealed that most of characters under study exhibited moderate to low phenotypic and genotypic variation. The highest phenotypic variation value was recorded for weight of corms per plant (180.75) followed by number of days taken for full spike emergence (117.18), spike length (104.37) and number of days taken for first floret to show colour (100.08). The maximum value of genotypic variation was recorded for weight of corms per plant (180.48 g) followed by number of corms per plant (161.77), number of days taken for full spike emergence (117.04) and spike length (104.27). The remaining characters exhibited low phenotypic and genotypic variations. The maximum phenotypic and genotypic coefficient of variation was recorded for corm size (22.05, 22.79 cm) followed by weight of corms (18.16, 18.24 g) and weight of corms (18.12, 18.13 g) respectively. The highest heritability along with high genetic advance was observed for weight of corms per plant (99.00, 35.44) followed by number of days taken for full spike emergence (99.00, 28.54), spike length (99.30, 26.94), number of days taken for first floret to show colour (99.40, 26.37) and number of days taken for spike initiation (99.10, 26.15).

Heritability and genetic advance are important selection parameters. Heritability estimates along with genetic advance are more useful in predicting the gain under selection than heritability estimates alone. However, it is not necessary that a characters showing high heritability will also exhibit high genetic advance. Estimates of heritability also give some idea about the gene action involved in the various polygenic traits.

Data pertaining to the genotypic correlation on twelve vegetative, flowering and corms related traits in Table 2, revealed that positive and significant correlation was recorded for weight of corms per plot with size of corms per plant (0.906), spike length (0.764), plant height (0.669) and number of florets

per spike (0.454). The size of corms per plant had positive and significant correlation with weight of corms per plant (0.902), spike length (0.637) and plant height (0.565). The weight of corms per plant had positive and significant correlation with spike length (0.756) and plant height (0.674) and number of corms per plant (0.462). The number of days taken for harvesting had positive and significant correlation with number of days taken for first floret to show colour (0.964), number of days taken for full spike emergence (0.932), number of days taken for spike initiation (0.929) and number of days taken for first floret to open (0.886). The number of days taken for first floret to show colour had positive and significant correlation with number of days taken for full spike emergence (0.961), number of days taken for spike initiation (0.956) and number of days taken for first floret to open (0.937).

At the phenotypic level, weight of corms per plot had positive and significant correlation with weight of corms per plant (0.996), size of corms per plant (0.882), spike length (0.760), plant weight (0.664) and spike weight (0.408). The size of corms per plant had positive and significant correlation with weight of corms per plant (0.875), spike length (0.615) and plant height (0.538). The corm weight per plant had positive and significant correlation with spike length (0.755) and plant height (0.672). The number of days taken for first floret to show colour had positive and significant correlation with number of days taken for full spike emergence (0.960), number of days taken for spike initiation (0.954) and number of days taken for first floret to open (0.936).

From the above findings, it can be concluded that maximum weight of corms per plot was recorded in Rigency followed by Picardy and Tiger Flame. It is clear that for bringing out desired improvement towards corm yield in gladiolus, these genotypes can be used as direct selection for future improvement.

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**Table 2.** Genotypic (G) and phenotypic (P) correlation coefficient for different pairs of characters in gladiolus genotypes.

Character	Plant height (cm)	No. of days taken for spike initiation	No. of days taken for full spike emergence	No. of days taken for first floret to open	No. of days taken for first floret to show colour	Spike length (cm)	Spike weight (g)	No. of days taken for harvesting	No. of corms per spike	Corms wt. per plant (g)	Corms size per plant (cm)	Corms wt. per plot (kg)
Plant height (cm)	0.274	0.266	0.308	0.264	0.555**	0.575**	0.108	-0.640**	0.674**	0.565**	0.669**	
No. of days taken for spike initiation	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373
No. of days taken for full spike emergence		0.986**	0.973**	0.956**	0.985**	0.985**	0.243	0.929**	0.006	0.203	-0.109	0.204
No. of days taken for first spike emergence		0.985**	0.985**	0.985**	0.961**	0.985**	0.259	0.932**	0.985**	0.985**	0.985**	0.985**
No. of days taken for first floret to open			0.977**	0.976**	0.976**	0.006	0.259	0.932**	-0.023	0.246	0.187	0.244
No. of days taken for first floret to show colour			0.976**	0.937**	0.936**	0.976**	0.174	0.886**	0.976**	0.976**	0.976**	0.976**
No. of days taken for first floret to show colour				0.936**	0.936**	0.102	0.936**	0.936**	0.123	0.228	0.169	0.230
Spike length (cm)						0.936**	0.936**	0.936**	0.936**	0.936**	0.936**	0.936**
Spike weight (g)							0.936**	0.936**	0.936**	0.936**	0.936**	0.936**
No. of days taken for harvesting								0.964**	0.109	0.243	0.222	0.243
No. of corms per spike								0.409*	0.409*	0.409*	0.409*	0.409*
Weight of corms per plant (g)									0.568**	0.756**	0.637**	0.764**
Size of corms per plants (cm)									0.567**	0.567**	0.567**	0.567**
									0.292	0.384	0.354	0.410*
									0.262	0.262	0.262	0.262
									-0.044	0.325	0.295	0.328
									0.021	0.021	0.021	0.021
									0.462**	0.462**	0.250	0.454**
									0.209	0.209	0.209	0.209
										0.902**	0.902**	1.00
										0.875**	0.875**	0.875**
												0.906**
												0.118

\*, \*\* Significant at 5 and 1% levels, respectively.

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