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## Genetic variability studies in gladiolus (*Gladiolus grandiflorus* Linn.) under Chitrakoot condition

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### Abstract

Fifteen different genotypes of gladiolus were evaluated for sixteen characters to study the genetic variability, GCV and PCV, heritability, genetic advance for growth, flowering and physiological characters improvement in Gladiolus under Chitrakoot condition. The mean sum of squares due to genotypes showed significant differences for all characters. The magnitude of (GCV and PCV) were found highest for yield of spike (no.) per plant yield of spike (lakh no.) ha<sup>-1</sup>, specific leaf weight (SLW) and specific leaf area (SLA). The highest heritability was observed for character viz. Length of Pseudo Stem (cm) and leaf area per plant (cm<sup>2</sup>), plant height (cm), number of leaves per plant, length of spike (cm) and leaf area index (LAI), vase life of cut flowers (days) Specific leaf area (SLA), days to sprouting, number of florets per spike, days taken to flower initiation, self life of cut flowers (days), yield of spike (no.) per plant, yield of spike (lakh No.) ha<sup>-1</sup>, specific leaf weight (SLW) and high genetic advance was recorded for specific leaf area (SLA) and leaf area per plant (cm<sup>2</sup>).

**Keywords:** GCV, PCV, heritability, genetic advance and gladiolus

### Introduction

Floriculture, which includes production and trade of cut flowers, potted plants, foliage, dried flowers and plants, bedding plants and stashing material (bulbs, plantlets and seeds), is experiencing a rapid change with growing per caput expendable income. Consumption of flowers has increased both in traditional and non-traditional centres. With increasing demand, production centres have expanded from traditional centres (USA, Japan, the Netherlands and Columbia) to new centres, Like Latin America, Africa and Asia. In Asia, India, China, Vietnam and Sri Lanka are moving in direction of intensive floriculture. New consumption centres are also emerging in Asia and Eastern Europe. The scenario provides opportunity to capitalize on the strength and convert weaknesses into opportunity. However in consumer-driven market, quality of service and delivery system will play a significant role. Marketing is no more a meeting of buyers and sellers, but it is complex, which is driven by quantity of products and reliability of delivery. New distribution structure with aid of IT is likely to be in place, which would be a virtual market, demanding branding, cataloguing and quality assurance.

Heritability tells us about the additive genetic variance and phenotypic variance. High heritability alone is not enough to make efficient selection in segregating generation, unless the information is accompanied for substantial amount of genetic advance. In all plant species including gladiolus the phenotypic expression of a character is governed mainly by the genetic make-up of the plant. Environmental factors in combination with genetic and physiological factors play an important role in determination of plant potential for propagating material. These characters appear to be under strong genetic control. The studies on variability and genetic parameters are of paramount importance for crop improvement programme.

The Chitrakoot region of Madhya Pradesh is non-traditional area of flower cultivation, However, cultivation of Gladiolus by some flower growers has inspired due to its handsome net profit of Rs. One lac to 1.50 lac per hectare. Hence, present study was planned to know the feasibility and profitability under Kymore plateau of Madhya Pradesh.

### Materials and methods

The present investigation "Genetic variability studies in Gladiolus (*Gladiolus grandiflorus* linn.) Under Chitrakoot Condition" was conducted at agriculture farm of Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, (Satna) which is located (80°21' to 81°23' East longitude and 23°58' to 25°12' North latitude).

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The altitude of Chitrakoot (Satna) is 317 meters above mean sea level. The chemical analysis of soil was conducted to determine the percentage of major elements viz., nitrogen, phosphorus, potash, organic, carbon, organic matter, pH and electrical conductivity. Nitrogen was estimated by Alkaline permanganate method. The phosphorus was estimated by Olsen's Colorimetric method and potash was estimated by Flame Photometric method respectively. The soil organic matter was estimated by Hydrochloric oxidation method as suggested by The pH of soil was determined by pH meter (Elico pH meter model 2.112). The experiment was laid out in R.B.D. with three replications and fifteen different genotypes. The experiment material was obtained from NBRI Lucknow. The mean data of each character was subjected to statistical analysis for variance and test the significance of each character as per the procedure of Panse and Sukhatme (1967)

[10]. Genotypic and phenotypic coefficients variation were calculated by standard procedures (Johnson *et al.*, 1955; [8]. Heritability ( $h^2$  broad sense) and Genetic advance method by Genetic advance as percentage over mean method by Johnson *et al.* (1955) [9].

## Results and discussion

Analysis of variance showed significant difference among the genotypes for the different characters at 0.1% and 5% significance. The mean sum of squares due to genotype for different characters are presented in Table 1. The highest significant differences observed specific leaf area (SLA) (1613.4630\*\*). In other words, the performance of the genotypes with respect to these characters was statistically different, suggesting scope for growth, flowering and physiological characters improvement in Gladiolus.

**Table 1:** Analysis of variance for 16 different qualitative and quantitative characters of gladiolus in.

S. No.	Characters	Replication df= 2	Genotypes df= 14	Error df= 28	Max.	Min.	Mean
1.	Days to Sprouting	0.2151	24.0170**	0.1807	21.70	13.57	16.08
2.	Plant Height (cm)	0.0724	129.0767**	0.1147	127.87	111.90	118.80
3.	Number of Leaves Per Plant	0.0591	19.0542**	0.0460	17.33	10.43	14.00
4.	Length of Pseudo Stem (cm)	0.1120	76.9067**	0.0633	78.10	66.80	71.60
5.	Days Taken to Flower Initiation	1.6538	166.1037**	1.4228	103.33	86.83	93.28
6.	Length of Spike (cm)	1.5484	345.6980**	0.4572	99.67	73.37	83.46
7.	Number of Florets Per Spike	0.5181	36.7050**	0.3307	21.67	12.80	17.28
8.	Yield of Spike (no.) Per Plant	0.0138	1.0863**	0.0147	2.60	1.10	1.74
9.	Yield of Spike (lakh No.) ha-1	0.0692	5.3532**	0.0726	5.78	2.45	3.88
10.	Self Life of Cut Flowers (days)	0.0591	7.9197**	0.0862	12.1	8.17	9.64
11.	Vase Life of Cut Flowers (days)	0.5071	26.6418**	0.0977	047.47	10.20	13.40
12.	Leaf Area Per Plant (cm-2)	0.3924	1121.5522**	0.4681	101.67	56.10	73.23
13.	Leaf Area Index (LAI)	0.0000	0.0057**	0.0000	0.23	0.13	0.16
14.	Specific Leaf Area (SLA)	0.2231	1613.4630**	9.4002	14.67	51.43	72.97
15.	Specific Leaf Weight (SLW)	0.0000	0.0001**	0.0000	0.02	0.01	0.01
16.	Harvest Index	4.9471	10.5296**	3.7257	34.58	30.23	31.64

Estimation of genetic variability GCV, PCV, heritability, GA, GA (%) as mean for growth, flowering and physiological characters of 15 varieties of Gladiolus (*Gladiolus grandiflorus* L.)

The estimates of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for growth, flowering and physiological characters of gladiolus different genotypes are presented in table 2 and Fig. 1 and Fig. 2 The magnitude of (GCV and PCV) were found highest for yield of spike (no.) per plant (24.23 and 25.21), yield of spike (lakh no.) ha-1 (24.20 and 25.108), specific leaf weight (SLW) (20.81 and 22.04) and specific leaf area (SLA) (22.41 & 22.80). The moderate values of GCV and PCV was recorded for characters viz. Leaf Area Index (LAI) (18.80 and 18.91), Leaf Area Per Plant (cm-2) (18.67 and 18.69), Vase Life of Cut Flowers (days) (15.69 and 15.86) and Self Life of Cut Flowers (days) (11.85 and 12.23), Number of Florets Per Spike (14.25 and 14.63), Number of Leaves Per Plant (12.72 and 12.81) and Days to Sprouting (12.39 and 12.67). The lowest values of GCV and PCV are recorded for characters viz. Length of Spike (cm) (9.09 and 9.12), Days Taken to Flower Initiation (5.62 and 5.76), Length of Pseudo Stem (cm) (5.00 and 5.01), Plant Height (cm) (3.90 and 3.91) and Harvest Index (3.40 and 7.03). Similar results were reported by Kispotta *et al.*, (2017) [1] and Pratap and Rao (2006) [5] in gladiolus.

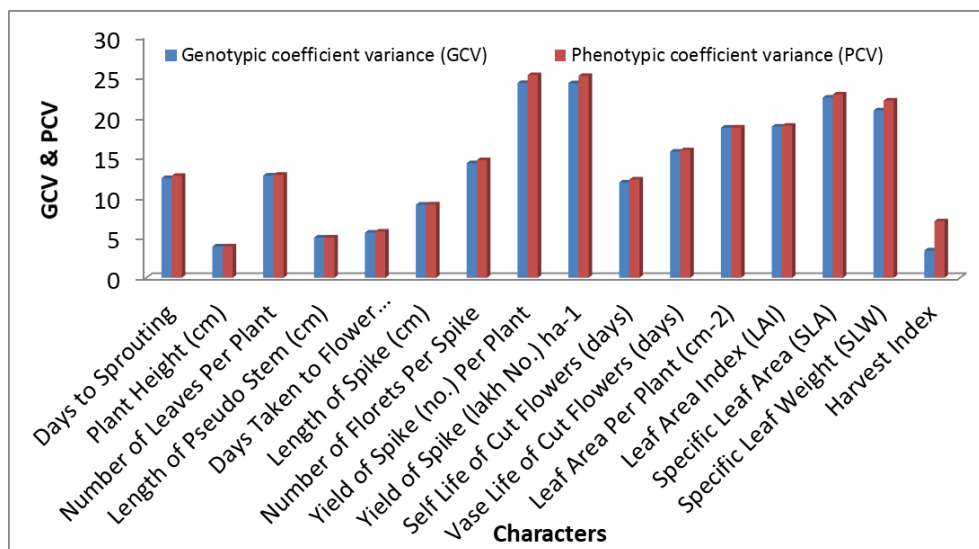
In the present study, the magnitude of heritability are presented in table 2 and fig. 2 ranged from Length of Pseudo Stem (cm) (100.00) to Harvest Index (23.00). The highest heritability was observed for character viz. Length of Pseudo Stem (cm) and Leaf Area Per Plant (cm-2) (100.00), Plant

Height (cm), Number of Leaves Per Plant, Length of Spike (cm) and Leaf Area Index (LAI) (99.00), Vase Life of Cut Flowers (days) (98.00) Specific Leaf Area (SLA) (97.00), Days to Sprouting (96.00), Number of Florets Per Spike (95.00), Days Taken to Flower Initiation (95.00), Self Life of Cut Flowers (days) (94.00), Yield of Spike (no.) Per Plant (92.00), Yield of Spike (lakh No.) ha-1 (92.00), Specific Leaf Weight (SLW) (89.00). The lowest heritability was found for characters viz., Harvest Index (23.00) Similar work were also reported by Kumar (2010) [2] and Maurya (2011) [3] and Pratap and Rao (2006) [5] in gladiolus.

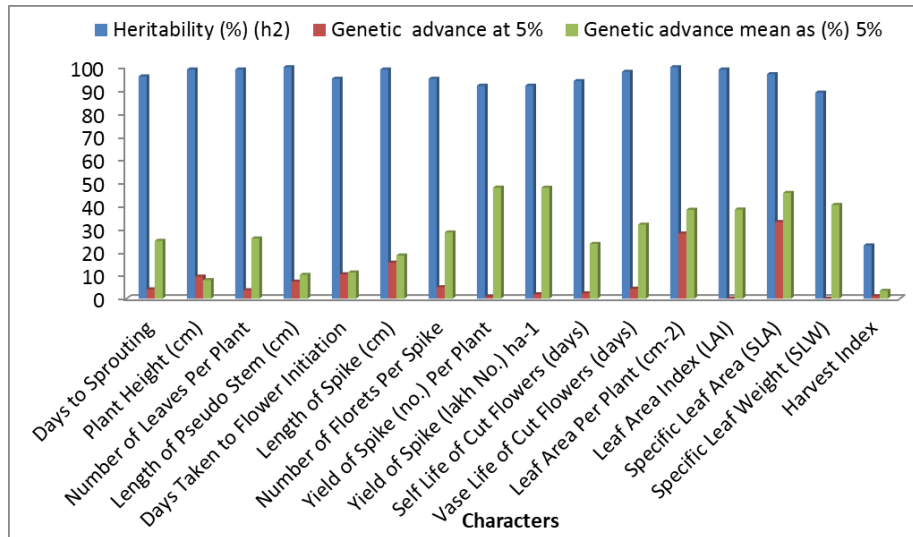
Genetic advance for various characters are presented in table 2 and fig. 2 and noticed that high genetic advance was recorded for Specific Leaf Area (SLA) (33.11) and Leaf Area Per Plant (cm-2) (28.12) and moderate estimates of genetic advance were noticed for characters Length of Spike (cm) (15.56) and Days Taken to Flower Initiation (10.52) while low genetic advance was recorded for character viz., Plant Height (cm) (9.53), Length of Pseudo Stem (cm) (7.35), Number of Florets Per Spike (4.94), Vase Life of Cut Flowers (days) (4.29), Days to Sprouting (4.02), Number of Leaves Per Plant (3.64), Self Life of Cut Flowers (days) (2.28), Yield of Spike (lakh No.) ha-1 (1.86), Yield of Spike (no.) Per Plant (0.84), Harvest Index (1.06), Leaf Area Index (LAI) (0.06) and Specific Leaf Weight (SLW) (0.01). Similar results were observed by Pratap and Rao (2006) [5] in gladiolus.

**Table 2:** Estimation of genetic variability GCV, PCV, heritability, GA, GA (%) as mean for growth, flowering and physiological characters of 15 varieties of Gladiolos (*Gladiolus grandiflorus* L.)

S. No.	Characters	Genotypic variance (GV)	Phenotypic variance (PV)	Genotypic coefficient variance (GCV)	Phenotypic coefficient variance (PCV)	Heritability (%) (h <sup>2</sup> )	Genetic advance at 5%	Genetic advance mean as (%) 5%
1.	Days to Sprouting	3.97	4.15	12.39	12.67	96.00	4.02	24.97
2.	Plant Height (cm)	21.49	21.61	3.90	3.91	99.00	9.53	8.02
3.	Number of Leaves Per Plant	3.17	3.21	12.72	12.81	99.00	3.64	26.01
4.	Length of Pseudo Stem (cm)	12.81	12.87	5.00	5.01	100.00	7.35	10.27
5.	Days Taken to Flower Initiation	27.45	28.87	5.62	5.76	95.00	10.52	11.28
6.	Length of Spike (cm)	57.54	58.00	9.09	9.12	99.00	15.56	18.65
7.	Number of Florets Per Spike	6.06	6.39	14.25	14.63	95.00	4.94	28.58
8.	Yield of Spike (no.) Per Plant	0.18	0.19	24.23	25.21	92.00	0.84	47.97
9.	Yield of Spike (lakh No.) ha-1	0.88	0.95	24.20	25.108	92.00	1.86	47.92
10.	Self Life of Cut Flowers (days)	1.31	1.39	11.85	12.23	94.00	2.28	23.64
11.	Vase Life of Cut Flowers (days)	4.42	4.52	15.69	15.86	98.00	4.29	31.97
12.	Leaf Area Per Plant (cm-2)	186.85	187.32	18.67	18.69	100.00	28.12	38.40
13.	Leaf Area Index (LAI)	0.00	0.00	18.80	18.91	99.00	0.06	38.50
14.	Specific Leaf Area (SLA)	267.34	276.74	22.41	22.80	97.00	33.11	45.67
15.	Specific Leaf Weight (SLW)	0.00	0.00	20.81	22.04	89.00	0.01	40.49
16.	Harvest Index	1.13	4.86	3.40	7.03	23.00	1.06	3.38



**Fig 1:** Estimation of genetic variability GCV and PCV for growth, flowering and physiological characters of 15 varieties of Gladiolos (*Gladiolus grandiflorus* L.)



**Fig 2:** Estimation of Heritability, GA, GA (%) as mean for growth, flowering and physiological characters of 15 varieties of Gladiolus (*Gladiolus grandiflorus* L.)

### Conclusion

The present experiment may be concluded that V<sub>1</sub> Salvia and Pricilla are identified as high yielding genotype. Yield of spike (No.) per plant and yield of spike (lakh No.) ha<sup>-1</sup> at Chitrakoot Agro Climatic Condition.

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