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## Studies on genetic variability parameters in gladiolus grown under Allahabad agro-climatic conditions

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### Abstract

An experiment to studies on genetic variability parameters in gladiolus grown under Allahabad agro-climatic conditions was carried out at Horticulture section, College of Agriculture Allahabad rabi season of 2017-2018 with ten Cultivars combinations in randomized block design with three replication. The varieties Yellow gold, Forta rosa, Priscilla, Jester, Morning Gold, Pitter pears, White Prosperity, Red White, Nova lux, Punjab morning. Evaluated were out of twenty two cultivars means estimated phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV). The characters, days to 50% sprouting, sprouting per corms, plant height, number of leaves per plant, Days taken to spike emergence, days taken colour break stage, days taken basal floret opening, days taken to 50% flowering, spike length, rachis length, floret diameter, spikes per plant, spikes per plant, vase life, corms per plant, diameter of corm, corm weight.

**Keywords:** Gladiolus, genetic variability, heritability, genetic advance, correlation

### Introduction

Gladiolus, a member of family Iridaceae is a native of South Africa (Mishra, 1977) Gladiolus as a crop has been very successful in India due to its majestic spikes containing attractive elegant and delicate florets of various shades, sequential opening of florets for a longer duration and good keeping quality of cut spikes. For a modern and industrialized floriculture, there is always demand and necessity of new varieties. So, there is a great challenge for the scientists to get a new dimension for gladiolus cultivation. Planning and execution of a breeding programmer for the development of new varieties depends, to a great extent upon the genetic magnitude of genetic variability. The genotypic and phenotypic coefficient of variation are helpful in exploring the nature of variability in the breeding population whereas, the estimates of heritability provides index of transmissibility of characters. Moreover, correlation study provides valuable information about the inter relationship among the various traits and influence of each component trait on yield, thereby aids in selection. Realizing the importance of above facts, the present study was carried out with forty four genotypes of gladiolus (all of cultivars) to estimate the genetic parameters such as genotypic co-efficient of variation, heritability, genetic advance and correlation coefficient to establish correlations among economic parameters in gladiolus.

### Materials and Methods

The experiment was carried out at the Departmental Research Field during of the year, 2017-18 Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology Science, Allahabad (U.P.) -211007 to find out the best performing varieties of Gladiolus for this region all together ten treatments including control with three replications were allocated in a randomized block design.

### Results and Discussion

In Allahabad, Gladiolus (*Gladiolus grandiflora* L.) is commercially grown during winter Season. The 10 Different Varieties were preferred for cultivation. In view to this, the present investigation was carried out to studies on genetic variability.

According to the result obtained from the data table statistical along which there probable discussion for genetic components like genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV) heritability.

### Analysis of Variance

The mean sum of square of different characters under study in given in below The analysis of variance for different quantitative characters revealed significant differences among the genotypes for parameters like number of day taken for corm sprouting, number of sprouting per corm, plant height (cm) (30, 60, 90 days after planting), number of leaves per

plant (30, 60, 90 days after planting), days taken to spike emergence, days taken for colour break stage, number of days taken for basal floret to open, number of days taken to 50 percent flowering, spike length in (cm), rachis length in (cm), diameter of first floret(cm/ mm),Vase life(days), number of corms per plant, number of cormels per plant, corm diameter (cm), corm weight(g), number of spikes per plant, spike yield per plot, spike yield per hectare. Which showed that considerable amount of genetic variability was present among the genotypes.

### Analysis of variance for 22 different characters in gladiolus

S. No	Characters	Mean of sum squares		
		Replications df=2	Genotypes df=9	Error df=18
1	Number of days taken for corm sprouting	0.127	11.719**	0.193
2	Number of sprouting per corm	0.000	0.104*	0.034
3	Plant height (cm) 30 Days	4.970	36.230**	3.288
4	Plant height (cm) 60 Days	2.057	193.239**	5.821
5	Plant height (cm) 90 Days	7.699	182.03**	5.589
6	Number of leaves per plant (30 DAP)	0.004	0.877**	0.028
7	Number of leaves per plant (60 DAP)	0.027	1.550**	0.021
8	Number of leaves per plant (90 DAP)	0.102	2.185**	0.056
9	Days taken to spikes initiation (days)	2.029	79.155**	2.908
10	Days taken to colour break stage	0.525	19.474**	0.661
11	Days taken for Basal floret opening	62.64	67.77	54.02
12	Days taken to 50% flower opening	0.489	36.525**	0.653
13	Spike length (cm)	18.947	457.350**	41.507
14	Rachis length (cm)	9.685	133.992**	18.629
15	Diameter of first floret	0.466	2.334**	0.275
16	Durability of spike (days)	0.151	1.234**	0.066
17	Corms per plant	0.0141	0.298**	0.004
18	Cormels per plant	1.233	304.800**	4.677
19	Corm diameter	0.081	0.575**	0.042
20	Corm weight	1.384	871.33**	5.279
21	Spike per plant	0.0524	0.1154*	0.044
22	Spike yield per plot	4.127	24.916**	6.185

### Mean performance and range

Mean value of the data recorded for various growth, yield of yield contributing characters are presented in Table 4.2 here

the mean value of individual characters which their probable discussion.

Character	Days Taken for Corm Sprouting	Sprouting/ Corm	Plant Height cm 30days	Plant Height 60days	Plant Height 90days	Leaves/ Plant 30days	Leaves/ Plant 60days	Leaves/ Plant 90days	Days Taken to Spike Emergence	Days Taken for Colour Break Stage	Days Taken for Basal Floret Opening
Yellow Gold	8.2000	1.8667	42.1000	67.8667	107.2733	4.0467	6.5333	8.3333	68.4100	75.3667	79.7867
Forta Rosa	7.7333	1.4667	52.2500	68.6000	110.3733	3.4833	5.2333	6.4200	68.3200	78.5633	84.6467
Priscilla	14.4000	1.7333	52.8333	57.3333	106.2467	5.1400	6.7800	7.7233	74.5000	83.9800	88.1900
Jester	8.7333	1.6000	49.2833	52.0000	105.0000	4.6667	5.3233	7.1033	66.4033	78.4300	81.2467
Morning Gold	8.8000	1.6000	49.7333	54.9833	105.3800	4.7000	5.2567	7.3333	66.4267	80.7633	83.8967
Pitter Pears	8.2667	1.7333	49.0500	52.3333	100.2933	4.4067	6.3333	8.1367	73.4500	82.9133	87.1533
White Prosperity	8.1333	1.4667	46.6667	52.0833	115.8800	3.6933	5.7467	7.7067	66.9667	78.6433	83.7433
Red White	7.4667	1.2667	49.2333	63.1167	126.0000	3.7967	6.3600	8.3367	76.9500	78.4300	71.9567
Nova Lux	8.9000	1.5333	54.6667	74.7333	116.3933	3.6667	7.3067	9.2800	75.2400	81.6800	85.5733
Punjab Morning	8.8667	1.3333	49.1000	61.0000	118.0133	4.2200	6.6067	6.7333	80.9733	80.6500	86.7367
Mean	8.9500	1.5600	49.4917	60.4050	111.0853	4.1820	6.1480	7.7107	71.7640	79.9420	83.2930
C.V.	4.9170	11.8328	3.6642	3.9942	2.1283	4.0371	2.4014	3.0810	2.3765	1.0171	8.8247
F ratio	60.5135	3.0609	11.0169	33.1956	32.5657	30.7820	71.1447	38.7240	27.2128	29.4575	1.2545
F Prob.	0.0000	0.0207	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3247
S.E.	0.2541	0.1066	1.0470	1.3930	1.3650	0.0975	0.0852	0.1372	0.9847	0.4694	4.2437
C.D. 5%	0.7549	0.3166	3.1108	4.1388	4.0557	0.2896	0.2533	0.4075	2.9256	1.3948	12.6087
C.D. 1%	1.0343	0.4338	4.2620	5.6704	5.5566	0.3968	0.3470	0.5583	4.0083	1.9109	17.2749
Range Lowest	7.4667	1.2667	42.1000	52.0000	100.2933	3.4833	5.2333	6.4200	66.4033	75.3667	71.9567
Range Highest	14.4000	1.8667	54.6667	74.7333	126.0000	5.1400	7.3067	9.2800	80.9733	83.9800	88.1900

Character	Days Taken to 50% Flowering	Spike Length	Rachis Length	First Floret Diameter	Vase Life	Corms/ Plant	Cormels/ Plant	Corm Diameter	Corm Weight	Spikes/ Plant	Spike Yield/ Plot
Yellow Gold	87.2633	118.6667	62.3333	10.0500	9.9000	1.6567	34.3333	6.6767	61.8333	1.8000	23.0000
Forta Rosa	95.7967	107.8267	68.9100	9.2833	9.1567	0.4767	15.3333	6.3233	85.1733	1.5933	24.6667
Priscilla	96.5133	113.5833	74.3300	10.9333	8.8833	1.2533	29.6667	7.0267	107.2500	1.6667	24.6000
Jester	87.9167	122.7733	77.8267	11.0167	8.1233	1.1633	39.3333	6.8267	94.2567	1.2000	18.0000
Morning Gold	91.9800	93.3300	62.1100	10.6367	8.8467	1.3600	28.0000	5.4000	123.6667	1.6767	23.8800
Pitter Pears	94.3133	103.4133	61.3567	10.6167	9.2200	1.0800	47.6667	6.2467	88.3233	1.5267	23.4667
White Prosperity	90.5633	100.9333	64.5133	11.6133	10.2500	1.2667	19.0000	6.4600	73.4800	1.3233	20.2667
Red White	97.6667	103.4433	63.1367	12.4833	8.4000	1.1200	22.6667	6.5367	92.7067	1.7567	28.5733
Nova Lux	93.6033	134.7200	76.9100	11.0500	8.7933	1.1000	40.3333	6.2567	88.3333	1.6233	25.2000
Punjab Morning	93.0267	102.3333	74.4700	10.1200	8.7567	1.5133	31.0000	6.3467	82.0467	1.3767	21.8667
Mean	92.8643	110.1023	68.5897	10.7803	9.0330	1.1990	30.7333	6.4100	89.7070	1.5543	23.3520
C.V.	0.8707	5.8515	6.2928	4.8694	2.8496	5.4073	7.0374	3.2001	2.5615	13.5321	10.6507
F ratio	55.8621	11.0185	7.1923	8.4724	18.6247	70.9719	65.1591	13.6681	165.0276	2.6100	4.0279
F Prob.	0.0000	0.0000	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0398	0.0058
S.E.	0.4668	3.7197	2.4920	0.3031	0.1486	0.0374	1.2487	0.1184	1.3266	0.1214	1.4360
C.D. 5%	1.3871	11.0517	7.4041	0.9005	0.4416	0.1112	3.7101	0.3519	3.9417	0.3608	4.2665
C.D. 1%	1.9004	15.1416	10.1441	1.2337	0.6050	0.1524	5.0831	0.4821	5.4004	0.4943	5.8454
Range Lowest	87.2633	93.3300	61.3567	9.2833	8.1233	0.4767	15.3333	5.4000	61.8333	1.2000	18.0000
Range Highest	97.6667	134.7200	77.8267	12.4833	10.2500	1.6567	47.6667	7.0267	123.6667	1.8000	28.5733

### Phenotypic and genotypic coefficient of variation

In the present investigation it is depicted from table 4.3 that estimates of phenotypic coefficient variation were higher than genotypic coefficient variation for all the characters studied indicating that the influence of environment on the extension of these characters, however good correspondence was observed between genotypic coefficient of variation and phenotypic coefficient of variation presented.

Maximum genotypic coefficient of variation (GCV) was observed for Days for cormles per plant (32.54) followed by corms per plant (26.11), days for corm sprouting (21.09), Corm weight (18.94), Plant height (60DAP) (13.68), where minimum genotypic coefficient of variation was observed for Days for basal floret open (2.57). Maximum phenotypic coefficient of variation was observed for cormles per plant (33.29) followed by corms per plant (26.66) days for corm sprouting (22.44), Corm weight (19.11), Plant height (60DAP) (13.68), where minimum phenotypic coefficient of variation was observed for Days for colour brick stage (3.29).

### Heritability and genetic advance

Heritability is a measure of extent of phenotypic variation caused by the action of gene for making effective

improvement in the characters for which selection is practice Heritability in broad sense according to Burton and Devane (1953) is the ratio of total genotypic variance and phenotypic variance, expressed in percentage. The estimate of heritability are more advantages when expressed in terms of genetic advance Johnson *et al.* (1995) suggested that without genetic advance the estimate of heritability will not heritability. In present investigation, heritability and genetic advance worked out for the 22 quantitative characters and are presented in table 4.3 Maximum heritability was observed for corm weight (98.00), followed by days for corm sprouting (95.00), leaves per plant 60DAP (95.00), corms per plant (95.00) similar observed where minimum heritability was observed for days for basal floret open (0.07). Maximum genetic advance as percentage of mean was recorded for corm weight (34.68) followed by spike length (21.27), cormles per plant (20.13), Plant height 60DAP (15.57) where minimum genetic advance was observed for sprouting per corm (0.20).

### Range, General mean, Phenotypic (PCV), Genotypic (GCV), heritability (h<sup>2</sup>) and expected Genetic advance (GA) for twenty two characters in gladiolus

Characters	Range		GM	GCV	PCV	h <sup>2</sup>	Genetic advance 5%
	R. lowest	R. Highest					
Days for corm sprouting	7.46	14.40	8.95	21.90	22.44	0.95	3.94
Sprouting per corm	1.26	1.86**	1.56**	9.80	15.36	0.40	0.20**
Plant height (30DAP) (cm)	42.10	54.66	49.49	6.69	7.63	0.77	5.98
Plant height (60DAP) (cm)	52.00	74.73	60.40	13.08	13.68	0.91	15.57
Plant height (90DAP) (cm)	100.29*	126.00	111.08*	6.90	7.22	0.91	15.09
Leaves per plant (30DAP)	3.48	5.14	4.18	12.72	13.34	0.90	1.04
Leaves per plant (60DAP)	5.23	7.30	6.14	11.61	11.85	0.95	1.44
Leaves per plant (90DAP)	6.42	9.28	7.71	10.92	11.35	0.92	1.67
Days for spike emergence	66.40	80.97	71.76	7.02	7.41	0.89	9.83
Days for color brake stage	75.36	83.98	79.94	3.13	3.29**	0.90	4.90
Days for basal floret open	71.95	88.19	83.23	2.57**	9.19	0.07**	1.23
Days for 50 % flowering	87.26	97.66	92.80	3.74	3.82	0.94	6.93
Spike length (cm)	93.33	134.72*	110.10	10.69	12.19	0.77	21.27
Rachis length (cm)	61.35	77.82	68.58	9.04	11.01	0.67	10.48
First floret diameter	9.28	12.48	10.78	7.68	9.09	0.71	1.44
Vase life	8.12	10.25	9.03	6.90	7.47	0.85	1.18
Corms per plant	0.47**	1.65	1.19	26.11	26.66	0.95	0.63
Cormles per plant	15.33	47.66	30.73	32.54*	33.29*	0.95	20.13
Corm diameter	5.40	7.02	6.41	6.57	7.31	0.80	0.78

Corm weight	61.83	123.66	89.70	18.94	19.11	0.98*	34.68*
Spikes per plant	1.20	1.80	1.55	9.91	16.77	0.34	0.18
Spike yield per plot	18.00	28.57	23.35	10.70	15.09	0.52	3.64

Maximum (\*)

Minimum (\*\*)

### Conclusion

On the basis of results shown in the present investigation it was concluded that the high magnitude of heritability (in broad sense) coupled with high genetic gain was observed for most of traits exhibiting additive genetic effect. The genotypes Nava lux followed by Priscilla, Punjab morning, white prosperity, Jester, produced higher spikes yield per plot. Which indicated that these genotypes may be sown for higher yield and indicated good response to selection owing to their high heritability, variability and genetic advance showing additive gene effect. These genotypes can be used for improvement of yield and component traits by selection.

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