

Assessment of Variability, Heritability and Genetic Advance in 20 Genotypes of Gladiolus (*Gladiolus grandiflorus* L.)

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Abstract

This study was undertaken to find out the estimates of genetic variability, analysis of variance, genetic parameters viz GCV, PCV, heritability and genetic advance among different flower traits between 20 genotypes of gladiolus. The experiment was repeated three times by using RBD (Randomized block design) at crop research centre, Department of Genetics and Plant Breeding, School of Agriculture, ITM University, Gwalior, Madhya Pradesh. Analysis of variance indicated highly significant difference for all the trait among 20 genotypes. The estimate of heritability varied from 92% to 42%. The highest heritability was estimated in broad sense was observed for the character leaf area (92.01%) and lowest for weight of daughter corms (42%). The genetic advance expressed as percent of mean ranged from 7.65% to 55.82%. The highest of genetic advance as percentage of mean was recorded for no. of shoots per corm (55.82%) and lowest for spike initiation (7.65). Environmental coefficient of variance (ECV) ranged from (2.72 to 37.13). the highest ECV was recorded for the character weight of daughter of corms (37.13) and lowest for days to spike initiation (2.72).

Key words: Gladiolus, GCV, PCV, Heritability, Genetic Advance as percentage of mean.

Introduction

Gladiolus is a bulbous ornamental flower having beautiful spikes as well as larger vase life, it belongs to family Iridaceae and sub-family Ixodidae, popularly known as “Queen of bulbous flower”. The centre of origin of Gladiolus is South Africa and widely spread in central Europe, Mediterranean region, western Asia and Asia Minor. This genus is mostly heteroploidy having, Ploidy in the genus ranges from diploid ($2n= 30$) to decaploid ($2n = 12X = 180$). Gladiolus occupies 8th position in international cut flower trade after Rose, Carnation and Chrysanthemum (Ahmad *et. al.*, 2008). Worldwide it is being grown in an area

of 11,660 ha in the country with an estimated production of 106 crore cut flowers (Verty *et.al.*, 2017). In India, major gladiolus producing states in country are Uttar Pradesh, West Bengal, Odisha, Chattisgarh, Haryana and Maharastra, as it is mainly a winter season flower crop, in areas having moderate climate conditions, gladiolus can be grown throughout the year. There are many varieties of gladiolus having beautiful inflorescence in large range of colours, different shades, size and wide range of No. of florets per spike. Genetic variation and Genetic relationship among genotypes are an important consideration for classification

and utilization of germplasm resources in breeding programmes (Kumar *et al.*, 2013). The and magnitude of genetic variability in gene pool is the prerequisite of the breeding programme (Bhujbal *et al.*, 2013).

The main objective of a plant of a breeder is to evolve high yielding varieties of Gladiolus suitable for cut flower purpose, it is therefore desirable for plant breeder to know the extent of relationship between yield and its various components which will facilitate selection based on component traits (Prasad *et al.*, 2011).

Thus, yield and association of yield contributing traits is considered to be of great importance for planning and executing breeding programme. Correlation study provide beneficial information regarding the inter relationship of yield traits there by aide in selection.

Materials and Method

The present investigation was carried out at CRC (Crop Research Centre), Department of Genetics and Plant Breeding, School of Agriculture, ITM University, Gwalior, Madhya Pradesh, India. The experiment was

conducted during 2021-2022 in Randomized block design (RBD) with three replications. The experimental material for the research consisted of 20 genotypes of gladiolus. 15 corms of each genotype were planted with the spacing of 30 ×15 cm. All the recommended agronomic practices and management were followed to grow a successful crop. The observations were recorded on five randomly selected plants for nine characters. The data were put to statistical analysis for Analysis of Variance (ANOVA) to study the variation among tested genotypes by using standard procedure suggested by (Steel and Torrie, 1980). Heritability and genetic advance were determined as per formulae suggested by (Hanson *et al.*, 1956).

Result and Discussion

Analysis of variance indicated highly significant differences for all the trait studied among 20 genotypes (Table 1). The significant difference represents existence of genetic variability in the population taken under study. Verty *et al.*, (2017), Aasia *et al.*, (2016) and Ahmad *et al.*, (2016), also found significant variation in plant height, No. of leaves per corm, leaf area, corms per plant and shoots per corm in 20 genotypes of Gladiolus.

Table 1. Analysis of Variance for nine characters in Gladiolus Genotypes

S. No	Characters	Replication	Treatments	Error
1	Days to spike initiation	25.03	52.82*	6.04
2	Plant height at spike fully opened	78.96	357.06*	50.54
3	Number of leaves per corm	2.43	2.10*	0.90
4	Leaf area	78.25	1139.71*	31.17
5	Spike length	14.38	461.82*	70.35
6	Number of floret per spike	1.30	34.88*	3.77
7	Number of corms per plant	1.23	1.72*	0.28
8	Weight of daughter corm	963.26	680.24*	213.25
9	Shoots per corm	0.13	1.33*	0.28

*Level of significance-5%

Genetic Coefficient of variation and Phenotypic coefficient of variation

Genetic parameters, Genotypic Coefficient of Variation (GCV), Phenotypic Coefficient of Variation (PCV), Heritability and Genetic Advance are useful biometrical tools for determination of genetic variability. Aditya *et al.*, (2011) and Sisodia *et al.*, (2018).

The estimates of PCV and GCV for different traits of *Gladiolus* are presented in Table 2. It is reported from earlier studies that genetic variability is a basic prerequisite for plant breeding program on which selection and other genetic tool like mutation and polyploidy breeding acts to evolved superior genotypes. Thus, the higher the amount of the variation present for the various traits in the chosen population greater will be the chances and higher will be the scope for its improvement through different selection procedures.

The values of PCV for different traits were higher than the corresponding GCV values which indicates that all the traits under study are subjected to influence by environmental factors. The magnitude of GCV and PCV was recorded highest for the character weight of daughter corms (31.72, 48.83) followed by no.

of shoots per corm (36.27, 48.52) and no. of corms per plant (33.16, 41.86). The lowest magnitude of GCV and PCV was observed for the characters days to spike initiation (4.38, 5.16) followed by plant height (9.07, 11.08) and no. of leaves per corm (9.14, 16.49).

The characters displaying high value of GCV and PCV indicates greater variation among the genotypes for such characters in the population of 20 genotypes. Under the present study, minimum values of GCV and PCV indicated very small amount of variability for the character among the genotypes, for the respective traits.

Positive and significant genotypic and phenotypic correlation in 15 *Gladiolus* cultivars for weight of daughter corms and no. of corms per plant was also reported by Sandhu *et al.*, (1993). The present result is in according with Moradi (2002), Bazzaz *et al.*, (2002).

The environmental coefficient of variation ranged from 2.72 for the character days to spike initiation to 37.13 for the character weight of daughter corms, similar result for ECV were also reported by Sisodia *et al.*, (2018).

Table 2. Estimation of coefficient of variation- GCV, PCV AND ECV of nine different characters in twenty genotypes of *Gladiolus*.

S. No	Characters	Coefficient of variation		
		GCV	PCV	ECV
1	Days to spike initiation	4.38	5.16	2.72
2	Plant height at spike fully opened	9.07	11.08	6.38
3	Number of Leaves per corm	9.14	16.49	13.72
4	Leaf area	13.90	14.48	4.04
5	Spike length	12.91	16.02	9.48
6	Number of florets per spike	20.00	23.36	12.06
7	Number of corms per plant	33.16	41.86	25.55
8	Weight of daughter corm	31.72	48.83	37.13
9	Shoots per corm	36.27	48.52	32.23

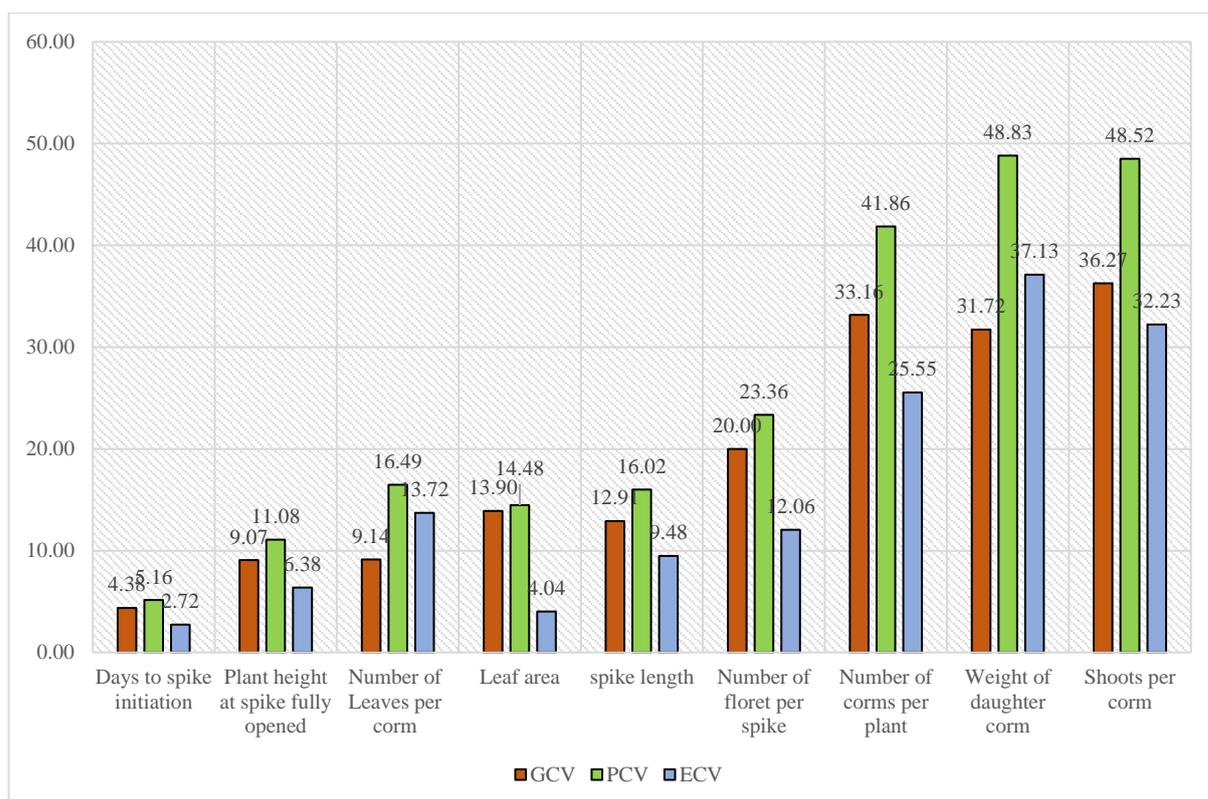


Fig 2. Graphical representation of GCV, PCV and ECV for nine traits in Gladiolus

Heritability

Heritability is important to a breeder since it specifies the possibility and the degree to which progress is potential through selection.

The more the character is heritable more will be the effectiveness of selection. Higher heritability only is not sufficient to put together competent selection in higher generations unless attained by high per cent of genetic advance. Thus, genetic advance is another important selection parameter.

Higher estimate of heritability along with high genetic advance expected to supply better scope for improvement in advancing generation. Heritability estimates for leaf area was maximum (92.00%), highest value of genetic advance was recorded for the character leaf area (38.03%) following spike length (18.97%), plant height (17.03%), weight of daughter corm (16.70%), days to spike initiation (6.91%), no. of florets per spike (5.68%), No of corms per plant (1.13), shoots

per corm (0.91%) and No. of leaves per corm (0.72%) with minimum value for genetic advance.

High value of genetic advance indicates additive gene action for the characters, leaf area, spike length and plant height on the other hand rest six characters whose genetic advance ranged from 16.7 to 0.72, indicates presence of non-additive gene action. Similar result was also reported by Kumar *et al.*, (2010) and Maurya *et al.*, (2011).

High heritability coupled with high genetic advance was observed for the character leaf area and spike length. Similar observation was reported by Maurya *et al.*, (2011) this indicates presence of additive gene action for this character. These results further suggested the considerable involvement of the environmental influence in the expression of these traits. Therefore, improvement could be made only through selection breeding. Bichoo *et al.*, (2002); Sisodia *et al.* (2018).

Table :4 Estimation of heritability (h^2), Genetic advance, and genetic advance as per cent of mean.

S. No	Characters	Heritability (h^2) bs	G.A. (%)	GAM (%)
1	Days to spike initiation	72.00	6.91	7.65
2	Plant height at spike fully opened	67.00	17.03	15.27
3	Number of Leaves per corm	31.00	0.72	10.44
4	Leaf area	92.00	38.03	27.50
5	spike length	65.00	18.97	21.44
6	Number of floret per spike	73.00	5.68	35.28
7	Number of corms per plant	63.00	1.13	54.11
8	Weight of daughter corm	42.00	16.70	42.45
9	Shoots per corm	56.00	0.91	55.84

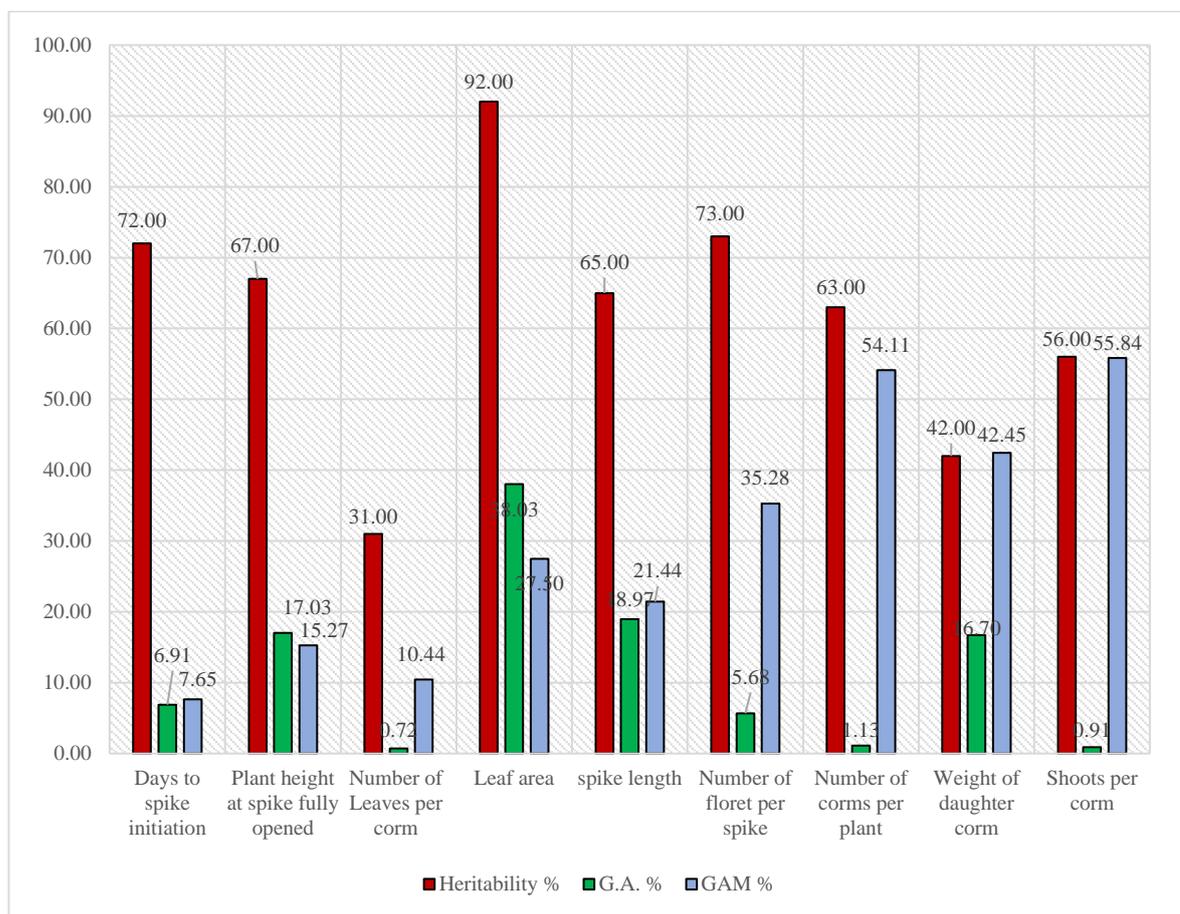


Fig 3. Graphical representation of heritability, genetic advance and genetic advance as per cent of mean for nine characters in 20 genotypes.

Conclusion

Significant differences for all the traits studied among the 20 genotypes was present. High degree of heritability along with high genetic advance was observed only for two characters viz., No. of leaves per corm and leaf area indicating towards minor involvement of environmental influence in the expression these traits. Hence, the scope of improvement is more by following selection procedures. For the characters with high heritability and low genetic advance the extent of environmental interference for the expression of trait is more hence improvement for such traits requires hybridization and mutation rather than selection breeding.

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