Biological Forum – An International Journal **15(2): 804-807(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Study on the Genetic Variability of Gladiolus (*Gladiolus hybrida* Hort.) under Southern Rajasthan

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(Received: 04 January 2023; Revised: 12 February 2023; Accepted: 16 February 2023; Published: 21 February 2023)
(Published by Research Trend)

ABSTRACT: The present research was carried out in the horticulture farm at the Rajasthan College of Agriculture, MPUAT, Udaipur, from October 2019 to May 2020. The experiment field was carried out in randomised block design (RBD) with 22 genotype of Gladiolus. The data was collected for 13 quantitative characters from five competitive plants that were randomly chosen from each replication. Indicating the impact of environment on these features, the phenotypic coefficient of variation (PCV) was larger than the genotypic coefficient of variation (GCV) for all characters. High phenotypic and genotypic coefficients of variation was recorded as the corm per plant (g) (30.4423 and 31.8004), spike per plant (28.7050 and 30.2679), Weight of cormels per plant (26.6444 and 27.869) respectively. The estimates of heritability varied from 30.48 to 30.48 % for different characters under study. It was found high for all the traits except vase life and spike durability in field.

Keywords: Gladiolus, GCV, PCV, Heritability and Genetic Advance.

INTRODUCTION

Gladiolus (*Gladiolus hybrid* L.) also called as the "sword lily," is an important cut flower in both the domestic and international markets. It originates in South Africa and is a member of the Iridaceae family. Its fascinating spikes show various florets with tepals that are smooth, ruffled, deeply crinkled, or laciniated and that are blotched or have distinct patches or markings of different colours and colour combinations. One of the most significant bulbous crops cultivated for commercial purposes, it is used to make cut flowers, bouquets, floral arrangements, home decoration, and garden exhibits.

Basic chromosome number is n=15. Ploidy in the genus ranges from diploid (2n=30) to dodecaploid (2n=180). The modern garden gladiolus is a complex hybrid from at least 12 species and most of the cultivars are tetraploids (2n=60) and highly heterozygous, they will not breed true to the type if grown from seeds due to cross pollination by honey bees. The genus gladiolus has 255 species over the world (Goldblatt and Manning 1998). In the cut flower trade, gladiolus rank fourth in the International market after the rose, carnation and chrysanthemum (Rathod *et al*. 2011). Major gladiolus-producing states in India are Uttar Pradesh, West Bengal, Odisha, Chattisgarh, Haryana, and Maharashtra. Although gladiolus is primarily a winter-season flower crop, it may be grown all year round in locations with a moderate environment. There are numerous varieties of gladiolus with magnificent inflorescence in a range of colours, sizes and shapes. Number of florets on each spike. For the classification and use of germplasm resources in breeding programmes, genetic variation and the genetic link among genotypes are crucial factors (Kumar *et al.,* 2013). The requirement of the breeding programme is the level and magnitude of genetic heterogeneity in the gene pool (Bhujbal *et al.,* 2013). It is important for plant breeders to understand the extent of the relationship between yield and its various components because this will make it easier to select plants based on component traits. The main goal of plant breeding is to develop high yielding varieties of Gladiolus suitable for cut flower purposes (Prasad *et al.,* 2011).

Genetic diversity is crucial for any crop's heritable progress. The variability for various characters is a prerequisite for a plant breeder to develop a tremendous yielding variety. It is crucial to study heritability (h2), genetic advance over a mean (GAM), genotypic coefficient of variation (GCV), and phenotypic coefficient of variation (PCV) in order to promote the effectiveness of selection (Patra and Mohanty 2019; Mishra *et al.,* 2014; Verty *et al.,* 2017).

MATERIAL AND METHODS

The present investigation was carried out in Randomized Block Design with three replications in the Experimental field of Department of Horticulture, Horticulture Farm, Rajasthan College of Agriculture, MPUAT, Udaipur during the year of 2019-20. Twenty two different varieties viz., Angalia, Arka Amar, Arka Kesar, Arka Pratham, Astralian Fair, Chandani, Friendship, Green Spire, GS-2, Mohini, Nathan Red, Punjab Beauty, Punjab Dawn, Punjab Glad-2, Praha, Priscella, Pusa Dhanavantri, Pusa Gunjan, Pusa Kiran, Pusa Sinduri, Pusa Srijan, Pusa Subham were used for the study. The entire experimental land was divided into subplots measuring 1.2 m × 1.8 m and there were totally 66 plots. Before planting Bavistin (3g/litre) treated corms were planted on the ridges to a depth of 6-8 cm by adopting a spacing of 30 × 20 cm. Five randomly selected competitive plants from each replication were used for recording thirteen quantitative traits. The observations were recorded on quantitative characters selected for genetic variability studies such as days to spike emergence, days to first floret show colour, days to last floret show colour, spike length (cm), rachis length (cm), spike per plant, Florets per spike, vase life (days), spike durability in field, corm per plant, weight of corm per plant (g), cormlets per plant and weight of cormlets per plant.

RESULTS AND DISCUSSION

A effective biometrical technique for determining genetic variability is the genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability, and genetic advance (Rashmi and Kumar 2014; Pal *et al*., 2017; Verty *et al*., 2017; Choudhary *et al*., 2012; Sisodia *et al*., (2018). Analysis of variance indicated highly significant differences for all the trait studied among 22 genotypes (Table 1). The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the traits studied, indicating that the apparent variation is due to genotype and the influence of the environment. Similar results were reported by Choudhary *et al.* (2012); Mishra *et al*. (2014); Naresh *et al*. (2015) in Gladiolus. The difference between GCV and PCV gives us an idea about the role of genotypic and environment on the character (Singh *et al*., 2017; Kumar *et al*., 2018).

Table 1: Estimates of phenotypic and genotypic coefficients of variation, heritability and genetic advance for difference traits of gladiolus genotypes.

Sr. No.	Mean	Range		Trait	GCV	PCV	ECV	Heritability (Broad Sense)	Genetic Advance	Genetic Advance as percentage of mean
		Max.	Min.							
1.	94.886	109.9	75.02	Days to spike emergence	8.2949	8.7914	2.913	89.02	15.2981	16.1226
2.	101.839	118.84	82.36	Days to first floret show colour	7.9821	8.5588	3.088	86.98	15.6173	15.3354
3.	113.629	133.2	94.4	Days to last floret show colour	7.1674	7.8705	3.252	82.93	15.2786	13.446
4.	83.8379	108.49	53.58	Spike length (cm)	15.378	16.21	5.128	89.99	25.1942	30.0511
5.	54.7243	70.575	35.41	Rachis length (cm)	17.446	18.243	5.331	91.46	18.8088	34.3701
6.	1.8546	3.061	1	Spike per plant	28.705	30.268	9.595	89.94	1.04	56.0779
7.	16.9997	23	10.91	Number of florets per spike	10.05	14.147	9.958	50.46	2.4999	14.7055
8.	11.5514	14.32	7.05	Vase life (days)	8.3713	12.172	8.836	47.3	1.37	11.86
9.	16.5819	19.94	12.3	Spike durability in field	5.432	9.8391	8.204	30.48	1.0244	6.1778
10.	1.5985	2.67	0.9813	Corm per plant	30.442	31.8	9.196	91.64	0.9596	60.0311
11.	47.1982	64.628	36.111	Corm weight per plant	13.707	13.885	2.22	97.44	13.1553	27.8725
12.	30.6915	43.52	15.914	Cormels per plant	26.307	27.824	8.007	91.72	16.1344	52.5696
13.	6.9766	10.29	4	Weight of cormels per plant (g)	26.644	27.869	9.207	89.09	3.5682	51.1451

A. Genotypic coefficient of variation (GCV)

Genotypic coefficient of variation (GCV) was observed for the characters ranging corm per plant (30.4423) to spike durability in field (5.432). High magnitude of GCV was recorded for the corm per plant (30.4423), spike per plant (28.7050), cormels per plant (26.6465), weight of cormels per plant 26.3044, rachis length (17.4461), spike length (15.3777) our findings were supported by Naresh *et al.* (2015); Verty *et al*. (2017); Mishra *et al*. (2014).

B. Phenotypic coefficient of variation (PCV)

A phenotypic coefficient of variation (PCV) was observed for the characters ranging from corm per plant (31.8004) to days to last florets show colour (7.8705). High magnitude of PCV was recorded for the corm per plant (31.8004), spike per plant (30.2679) and weight of cormels per plant (27.8691). Similar findings were reported by Kumar *et al*. (2019); Naresh *et al*. (2015); Rashmi and Kumar (2014); Verty *et al*. (2017); Mishra *et al*. (2014)

C. Heritability

The high heritability in the broad sense was observed for the characters *viz.* corm weight per plant (97.44), cormels per plant (91.72), corm per plant (91.64), rachis length (91.46) and spike length (89.99). The current observations support the previous findings observed by Kumar *et al*. (2018); Kispotta *et al*. (2017); Verty *et al*. (2017); Rashmi and Kumar (2014); Mishra *et al*. (2014).

D. Genetic Advances

The Genetic Advance estimates were found to be high for the spike length (25.1942), rachis length (18.8088), cormels per plant (16.1344) and days to first floret show colour (15.6173). similar observations were reported by Singh *et al*. (2017); Verty *et al*. (2017); Archana *et al*. (2008); Naresh *et al*. (2015); Swetha *et al*. (2019); Rahul *et al*. (2012); Rashmi and Kumar (2014); Verty *et al*. (2017); Mishra *et al*. (2014); Singh *et al*. (2017).

CONCLUSIONS

Based on the present investigation, the high magnitude of heritability (in broad sense) coupled with high genetic gain was observed for most traits exhibiting additive genetic effect. It was observed that PCV was higher than GCV for all the traits studied highest GCV and PCV is recorded as the corm per plant (g) (30.4423 and 31.8004), spike per plant (28.7050 and 30.2679), Weight of cormels per plant (26.6444 and 27.869) respectively.

Acknowledgement. The authors acknowledge the help rendered by the Department of horticulture, Rajasthan Agriculture College, MPUAT, Udaipur. For providing the experimental field site at their far as well as logistical support.
Conflict of Interest. None.

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How to cite this article: Manisha Verma, Saddam Husain, L.N. Mahawer, Poonam, H.L Bairwa and Sachin Kumar (2023). Study on the Genetic Variability of Gladiolus (*Gladiolus hybrida* Hort.) under Southern Rajasthan. *Biological Forum – An International Journal, 15*(2): 804-807.