

Genetic divergence studies in Gladiolus

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ABSTRACT : The present investigation was carried out with 20 genotypes of gladiolus (*Gladiolus grandiflorus* L.) which were evaluated to assess the genetic diversity existing among them. The data were subjected to multi varriate test. The original mean values were transformed to normalize variables & all possible D² values were collected. Grouping was done using Torcher's method. All the genotypes were grouped into eight clusters, indicating the presence of considerable divergence and variation for different growth, flowering and corms traits among the various genotypes. Cluster VII was largest with seven genotypes, followed by cluster IV and V with three genotypes each. Clusters VI and VIII had two genotypes and remaining clusters were having only one genotype each. The maximum intra cluster distance was exhibited by genotypes of cluster V. The inter cluster was highest between the cluster VIII and III and lowest between cluster IV and VI. The different clusters have higher mean values for different traits; the genotypes 'Regency' from cluster II, 'Pacifica' and 'Tiger Flame' from cluster VIII, 'Priscilla' 'American Beauty' and 'Praha' from cluster IV and Acidanthera from cluster I had considerable divergence.

Key words: Cluster, divergence, D² analysis, Gladiolus

Gladiolus (*Gladiolus grandiflorus* L.) is one of the important bulbous ornamental cut flower, which has both domestic and international market. It is also ideal both for garden display, floral arrangements for table and interior decoration as well as making high quality bouquet (Lepcha *et al.*, 2007). The main emphasis in gladiolus improvement has been on the development of varieties having attractive colour and large number of florets mainly for cut flower, long spikes, more number of well spaced large sized florets, and good corm multiplication ability (Swaroop and Janakiram, 2010). A wide range of genetic diversity among parents is an essential feature of any hybridization programme. Hence, the plant breeders are interested to estimate the range of genetic diversity among different genotypes which will help them to select parents in the hybridization programme to achieve the set goals. Mahalanobis D² analysis (1936) provides a mean to quantitatively estimate among crop plants and a similar attempt was made in the present investigation in gladiolus.

MATERIALS AND METHODS

Twenty diverse genotypes of gladiolus were assessed for their growth, flowering and yield contributing characters. The experiment was conducted in open field conditions at Model Floriculture Centre of Pantnagar during 2013-14 in randomized block design

(RBD) with three replications. The experimental material for present investigation was consisted of 20 genotypes. Ten corms of each genotype were planted with a spacing of 30 cm x 20 cm. All the recommended agronomic package of practices was followed to grow a successful crop. The observations were recorded on five randomly selected plants for 17 characters from each genotype per replication. Then data were subjected to multivariate analysis (Rao, 1952). The original mean values were transformed to normalise variables and all possible D²-values were calculated. The grouping of genotypes was done by using Torcher's method as described by Rao (1952). The criterion used in clustering by this method is that varieties belonging to the same cluster should show a smaller D²-value than those belonging to different clusters.

RESULTS AND DISCUSSION

Analysis of variance revealed significant differences among the genotypes for all the seventeen characters studied, indicating considerable amount of variability in gladiolus genotypes. All the genotypes were grouped into eight clusters (Table 1), indicating the presence of considerable divergence and variation for different growth, flowering and corms traits among the various genotypes. Cluster VII was largest with seven genotypes, followed by cluster IV and V with three genotypes each.

Table 1: Composition of different clusters of genotypes in gladiolus

Cluster	Name of genotypes	No. of genotype
I	Acidanthera	1
II	Regency	1
III	Agni	1
IV	Priscilla, American Beauty, Praha	3
V	Arka Kesar, Yellow Stone, Nathan White	3
VI	Yellow Golden, Careless	2
VII	Video, Her Majesty, Victor, Shagun, Fidelio, Topaz, Peter Pears	7
VIII	Tiger Flame, Pacifica	2

Clusters VI and VIII had two genotypes and remaining clusters were having only one genotype each. The maximum intra cluster distance (Table 2) was exhibited by genotypes of cluster V. The inter cluster distance was highest between the cluster VIII and III which indicate the members of these two clusters are genetically divergent to each other whereas lowest inter cluster distance between cluster IV and VI indicating the resemblance among the genotypes of these cluster for all the growth and flowering traits studied.

Contribution of each character towards genetic divergence was estimated from the number of times that character appeared in first rank (Table 3). It was observed that days taken to spike emergence contributed maximum (13.68%) towards genetic divergence,

Table 2: Intra and inter-cluster D^2 values and D values (in parenthesis)

Cluster	I	II	III	IV	V	VI	VII	VIII
I	0.000	44.382 (6.662)	24.582 (4.958)	37.577 (6.130)	29.236 (5.407)	34.460 (5.870)	26.770 (5.174)	40.858 (6.392)
II		0.000	62.110 (7.881)	21.595 (4.647)	41.0240 (6.405)	18.336 (4.282)	45.901 (6.775)	35.058 (5.921)
III			0.000	65.060 (8.066)	35.510 (5.959)	60.637 (7.787)	22.175 (4.709)	66.471 (8.153)
IV				3.020 (1.738)	27.963 (5.288)	10.401 (3.225)	28.526 (5.341)	16.0801 (4.010)
V					6.980 (2.642)	18.836 (4.340)	18.207 (4.267)	42.081 (6.487)
VI						1.866 (1.366)	23.951 (4.894)	24.522 (4.952)
VII							6.022 (2.454)	27.794 (5.272)
VIII								3.736 (1.933)

Table 3: Relative contribution of different characters to genetic divergence among gladiolus

Character	Per cent contribution
Plant height (cm)	7.37
No. of leaves/ plant	5.79
Leaf width (cm)	8.42
Days taken to spike emergence	13.68
Days taken to first floret showing colour	4.21
Total blooming life (day)	8.95
Spike length (cm)	2.63
Rachis length (cm)	1.05
Dia. of 2nd floret (cm)	2.63
No. of florets per spike	6.48
Fresh wt. of spike (g)	1.05
Vase life (day)	6.84
Corm dia.(cm)	3.65
Fresh wt. of corm (g)	6.84
No. of corms /plant	8.42
No. of cormels per plant	6.32
Cormel dia.(mm)	5.26

Table 4: Cluster group mean for various characters in gladiolus

Character	I	II	III	IV	V	VI	VII	VIII
Plant height (cm)	71.84	77.33	61.50	74.57	58.19	66.61	54.89	57.78
No. of leaves/ plant	8.89	9.33	9.00	8.15	8.02	8.59	7.40	9.00
Leaf width (cm)	2.44	3.74	2.27	3.18	2.62	3.40	2.68	2.48
Days taken to spike emergence	74.37	87.62	77.60	78.15	57.40	78.28	85.13	90.52
Days taken to first floret showing colour	84.62	96.52	96.90	93.86	70.14	90.15	96.35	102.99
Total blooming life (day)	17.15	17.47	12.29	18.98	16.78	19.15	15.90	18.52
Spike length (cm)	91.79	94.15	67.89	102.23	79.11	88.17	70.43	102.72
Rachis length (cm)	27.24	32.73	21.95	49.70	31.93	40.52	30.04	47.04
Dia. of 2nd floret (cm)	6.04	8.98	5.56	10.67	8.87	8.99	9.31	11.34
No. of florets per spike	6.54	12.79	7.57	14.32	12.11	14.15	11.24	14.02
Fresh wt. of spike (g)	56.06	72.82	39.98	81.25	57.98	67.54	51.08	81.65
Vase life (day)	11.33	9.35	6.45	8.33	7.15	8.97	7.69	10.03
Corm dia.(cm)	5.17	6.97	5.55	5.83	5.57	5.51	4.73	5.08
Fresh wt. of corm (g)	20.15	68.65	23.36	29.71	38.09	41.87	19.72	25.36
No. of corms /plant	2.65	1.67	3.53	2.45	1.62	1.00	2.56	2.50
No. of cormels per plant	5.45	12.67	3.00	2.65	4.36	4.42	6.28	19.44
Cormel dia. (mm)	9.05	8.56	7.70	10.08	10.87	13.28	10.52	9.34

followed by total blooming life (8.95%), number of corms per plant and leaf width (8.42%), plant height (7.37%) and fresh weight of corm and vase life (6.84). These characters showed highest contribution in differentiating at intra cluster level. Selection for divergent parents based on these characters will be useful for heterosis breeding in gladiolus. Similar observations have been recorded by Pal (2004) and Nimbalkar *et al.* (2006) in gladiolus crop. Therefore, it has been understood that characters need to be given more weightage, while selecting parents for improvement of gladiolus (Sheikh and Khanday, 2008).

As far as the cluster means are concerned (Table 4), different clusters have higher mean values for different traits indicating that few of the cluster contained genotypes with most of the desirable characters. Cluster II included the genotypes with highest plant height, number of leaves per plant, leaf width, diameter of corm and fresh weight of corm. In cluster VIII, the genotypes were late flowering, longest spike length, maximum floret diameter and highest producer of cormels per plant and weight of spike. The genotypes included in cluster VII were dwarf and with least number of leaves. Likewise, cluster IV was marked with longest rachis length and more number of florets per spike. In cluster I, the genotype, *Acidanthera*, possessed more vase life.

The genotypes 'Regency' from cluster II, 'Pacifica' and 'Tiger Flame' from cluster VIII, 'Praha' from cluster IV and 'Acidanthera' from cluster I respectively deserve

to be potent parents for further utilization in gladiolus improvement programme.

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