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RESEARCH ARTICLE

Estimation of genetic variability, correlation and path analysis in gladiolus (*Gladiolus species* L.)

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SUMMARY

The experiment was carried out to access the extent of genetic variability, heritability, genetic advance, correlation and path co-efficient for 13 diverse genotypes of gladiolus during the year of 2010-2011. Considerable amount of variation was observed for all the characters under study. The phenotypic co-efficient of variance (PCV) was higher than their respective genotypic co-efficient of variance (GCV) for all the characters. The PCV and GCV estimate were high for number of cormels per plant followed by leaf width, corm weight per plot, corm weight per plant and number of corms per plant. Genotypic correlation co-efficient were higher in magnitude over phenotypic correlations co-efficient, corms weight per plant was significantly and positively correlated with spike weight, number of cormels per plant, number of corms per plant, spike initiation, number of floret per spike and number of leaves per plant. Path co-efficient studies show that the spike weight (0.9810) had highest direct effect on corms weight per plant followed by number of cormels per plant (0.8250), number of leaves per plant (0.3789) and spike initiation (0.3520) and direct selection could be made for these characters for improving the yield.

Key Words : Genetic variability, Correlation, Path analysis, Gladiolus

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Gladiolus (*Gladiolus species* L.) is one of the most important bulbous, ornamental crops for cut flower trade in the world. It is native to South Africa and known as Sword lily or corn flag. The name gladiolus was coined by Pliny to describe the shape of the leaf and the name gladiolus has been derived from Latin word gladius meaning a sword as it has sword shaped leaves. The gladiolus commonly belongs to the family Iridaceae and there are about 260 species of gladiolus. It has chromosome number 2n=30. It is a tender, herbaceous, perennial, and is grown for seed and corms. Long keeping quality of gladiolus makes it a very popular commercial cut flower after rose. There have been mostly evolved through conventional breeding, but a few through mutation breeding. The development of varieties with attractive colours, large sized florets, long spike, increased number of florets, good stem strength, resistance to major pest and diseases, long base life and good corm multiplication rate have been the major objective of gladiolus breeding. Gladiolus is an important commercial cut flower but a very little information is available on its genetic potential for yield and yield contributing traits. So, in the present experiment effort was made to investige the extent of genetic variability to know the interaction of 12 characters and to understand the nature of direct and indirect effect of those characters on yield.

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MATERIAL AND METHODS

The experiment was carried out at Horticulture Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow, during

the year of 2010-11. The investigation was laid out under Randomized Block Design with three replications. The row to row and plant to plant spacing were maintained at 30 x 20 cm, respectively. Thirteen genotypes of gladiolus were used as experimental materials *viz*., Regency, Tambari, Tiger Flame, Aldebaran, Promise, Snow Princess, Prescilla, Praha, Golden Game, Sylvia, White Prosperity, Red Beauty and Yellow Stone. All the agronomic package of practices was taken to grow a healthy crop. The observations were recorded from five randomly selected plants from each genotypes in each replication for plant height (cm), number of leaves per plant, leaf width (cm), number of days taken for spike initiation, number of days for first flower taken for to open, spike length (cm), number of florets per spike, spike weight (g), number of corms per plant, weight of corms per plant, weight of corms per plot (kg) and number of cormels per plant. The estimate of heritability and genetic advance were calculated by the methods of Hanson *et al.* (1956) and Johnson *et al.* (1955), respectively. Genotypic and phenotypic co-efficients of variation were calculated as the method suggested by Burton and De Vane (1953). Correlation co-efficient and path analysis were calculated by Al-Jibouri *et al.* (1958) and Dewey and Lu (1959), respectively.

RESULTS AND DISCUSSION

Analysis of variance revealed that mean sum of squares due to varieties were significant for all the characters. The extent of variability with respect to 12 yield and yield attributing traits in 13 genotypes observed in terms of range, mean, genotypic co-efficient of variation (GCV), phenotypic co-efficient of variation (PCV) along with the amount of heritability (h^2), genetic advance and genetic advances (as % of mean) are given in Table 1. There were a considerable amount of variability was recorded for most of the characters.

The plant height, leaf width, number of leaves per plant, spike initiation, first floret to open, spike length and spike weight ranged from 63.20 to 85.56, 3.19 to 5.86, 12.43 to 14.85, 69.14 to 79.73, 73.82 to 95.45, 56.97 to 65.01 and 51.60 to 73.75, respectively. Number of florets per spike, number of corms per plant, corm weight per plant, corm weight per plot and number of cormels per plant ranged from 10.44 to 14.14, 1.55 to 2.42, 55.64 to 82.72, 0.50 to 0.75 and 6.41 to 11.36, respectively. The PCV was higher than GCV in all the characters indicating the role of environment in the expression of genotypes. The GCV estimates were maximum for number of cormels per plants followed by leaf width, corm weight per plot, number of corms plant and corms weight per plant. Heritability estimates were high for plant height (98.73%) followed by corms weight per plant (88.75%), first floret to open (87.49%) and spike length (80.27%) and moderate for spike initiation (77.95%), number of corms per plant (73.40%), number of cormels per plant (70.32%) and corms weight per plot (55.55%). High heritability values were associated with high value of genetic advances (as % of mean) for number of cormels per plant, number of corms per plants, number of corms per plant, corms weight per plant, leaf width corms weight per plot and first floret to open. High heritability accompanied by high genetic advance is more useful than heritability along and considerable importance can be made in these characters by predicting the result and selecting. The best individual (Johnson *et al.*, 1955). High heritability along with high genetic advance indicates these characters were due to considerable additive gene effects (Panse and Sukhatme, 1967). Higher heritability along with high genetic advance (as % of mean) was recorded for number of cormels per plants, number of corms per plant, corms weight per plant, corms weight per plot and first floret to open.

In general, the genotypic correlations were higher than the phenotypic correlations, which revealed that the phenotypic expression of the correlation is reduced under the influence of environment, although there is a strong inherent association between the different characters (Table 1). At the

Table 1 : Estimate of genotypic and phenotypic variation, heritability and genetic advance for 12 characters in gladiolus

Sr. No.	Characters	Range		Mean	P C V (%)	G C V (%)	Heritability (%)	Genetic advance	Genetic advance (as % of mean)
		Minimum	Maximum						
1.	Plant height (cm)	63.20	85.56	74.36	7.56	7.51	98.73	14.66	19.72
2.	Leaf width (cm)	3.19	5.86	4.53	25.21	15.50	37.69	1.14	25.17
3.	Number of leaves per plant	12.43	14.85	13.46	6.26	6.07	48.10	2.09	15.53
4.	Spike initiation	69.14	79.73	72.70	5.09	4.49	77.95	7.62	10.48
5.	First floret to open	73.82	95.45	82.92	9.51	8.90	87.49	18.23	21.98
6.	Spike length (cm)	56.97	65.01	60.52	4.24	3.84	80.27	5.44	8.98
7.	Spike weight (g)	51.60	73.75	64.70	12.38	8.78	50.23	10.63	16.43
8.	Number of florets per spike	10.44	14.14	12.39	11.54	6.35	30.39	1.14	9.23
9.	Number of corms per plant	1.55	2.42	1.97	15.58	13.32	73.40	0.59	30.06
10.	Corm weight per plant	55.64	82.72	70.27	11.24	10.59	88.75	18.51	26.34
11.	Corm weight per plot	0.50	0.75	0.62	14.87	11.49	55.55	0.14	23.44
12.	Number of cormels per plant	6.41	11.36	8.03	21.93	18.38	70.32	3.27	40.67

Table 2 : Genotypic (RG) and Phenotypic correlation among different characters of gladiolus

Sr. No.	Characters	Symbol	Plant height (cm)	Leaf width (cm)	Number of leaves per plant	Spike initiation	First floret to open	Spike length (cm)	Spike weight (g)	Number of florets per spike	Number of corms per plant	Number of cormels per plant	Corms weight per plant
1.	Plant height (cm)	G		0.145	0.110	0.318	-0.214	-0.206	-0.174	0.680**	0.755**	0.478**	-0.251
		P		0.088	0.114	0.272	-0.198	-0.191	0.160	0.392*	0.640**	0.394*	-0.240
2.	Leaf width (cm)	G			0.675**	0.579**	0.192	0.103	0.874**	0.679**	0.104	0.650**	0.242
		P			0.388**	0.253	0.220	0.164	0.301*	0.634**	0.083	0.320*	0.144
3.	Number of leaves per plant	G				0.716**	0.127	-0.258	0.407**	-0.327	0.255	0.418**	0.444**
		P				0.834**	0.132	0.255	0.289	-0.238	0.266	0.403*	0.427**
4.	Spike initiation	G					0.701**	0.451**	0.442**	-0.158	0.982**	0.310	0.560**
		P					0.647**	0.358*	0.281	0.174	0.222	0.281	0.412**
5.	First floret to open	G						-0.257	0.919**	0.177	-0.201	0.377*	0.047
		P						0.159	0.881**	0.127	0.106	0.115	0.012
6.	Spike length (cm)	G							0.611**	-0.122	0.452**	0.310	-0.272
		P							0.522**	0.144	0.283	0.213	-0.241
7.	Spike weight (g)	G								0.849**	0.581**	0.467**	0.819**
		P								0.763**	0.295	0.278	0.739**
8.	Number of florets per spike	G									0.383	0.492**	0.495**
		P									0.221	0.230	0.415**
9.	Number of corms per plant	G										0.196	0.563**
		P										0.300	0.533**
10.	Number of cormels per plant	G											0.611**
		P											0.575**

Table 3 : Direct (Diagonal) and indirect effects of different traits contributing to weight of corm/plant in gladiolus (Phenotypic level)

Sr. No.	Characters	Plant height (cm)	Leaf width (cm)	Number of leaves per plant	Spike initiation	First floret to open	Spike length (cm)	Spike weight (g)	Number of florets per spike	Number of corms per plant	Number of cormels per plant	Corms weight per plant
1.	Plant height (cm)	**-0.2869**	-0.0255	-0.0319	-0.0783	0.0568	0.0548	0.0460	-0.1125	-0.1838	0.1131	-0.240
2.	Leaf width (cm)	0.0120	**0.1350**	0.0524	-0.0342	0.0298	0.0222	-0.0407	0.0086	0.0112	0.0432	0.144
3.	Number of leaves per plant	0.0432	0.1471	**0.378**	0.0316	0.0502	-0.0968	-0.1097	-0.0903	-0.0101	0.1529	0.427
4.	Spike initiation	0.0096	-0.0089	0.0029	**0.352**	-0.0023	-0.0126	0.0099	-0.0061	0.0008	-0.0099	0.412
5.	First floret to open	0.0383	-0.0427	-0.0256	0.0125	**-0.1934**	0.0308	-0.0170	0.0246	0.0207	0.0073	0.012
6.	Spike length (cm)	0.0579	-0.0498	0.0774	0.1087	0.0483	**-0.3030**	0.0158	-0.0044	0.0858	-0.0645	-0.241
7.	Spike weight (g)	0.0157	-0.0296	-0.0284	0.0276	0.0086	-0.0051	**0.981**	0.0075	-0.0290	-0.0274	0.739
8.	Number of florets per spike	0.0450	0.0073	-0.0273	0.0200	-0.0146	0.0017	0.0087	**0.1147**	0.0254	-0.0264	0.415
9.	Number of corms per plant	-0.1103	-0.0143	-0.0046	-0.0038	0.0184	0.0487	0.0509	-0.0381	**-0.1722**	0.0052	0.533
10.	Number of cormels per plant	-0.0325	0.0264	0.0333	-0.0232	-0.0031	0.0176	-0.0230	-0.0190	-0.0025	**0.825**	0.575

genotypic level, corms weight per plant was recorded positive and significant correlation with spike weight (0.819) followed by number of cormels per plants (0.611), number of corms per plant (0.563), spike initiation (0.560), number of floret per spike (0.495) and number of leaves per plant (0.444) (Table 2). The number of cormels per plant had positive and significant correlation with number of floret per spike (0.492), spike weight (0.467), first floret to open (0.377), number of leaves per plant (0.418), leaf width (0.650) and plant height (0.478). The number of corms per plant has positive and significant correlation with spike weight (0.581), spike length (0.452), spike initiation (0.982) and plant height (0.755). The number of floret per spike had positive and significant correlation with spike weight (0.849), leaf width (0.679) and plant height (0.680). The weight of spike was found positively and significantly correlated with spike weight (0.611), first floret to open (0.919), spike initiation (0.442), number of leaves per plant (0.407) and leaf width (0.874). Length of spike showed positive and significant correlation with days to spike initiation (0.701). Days to spike initiation showed positive and significant correlation with number of leaves per plant (0.716) and leaf width (0.579). The number of leaves per plant showed positive and significant correlation with leaf width (0.675).

At the phenotypic level, corms weight per plant showed positive and significant correlation with spike weight (0.739) followed by number of cormels per plant (0.575), number of corms per plant (0.533), number of leaves per plant (0.427), number of floret per spike (0.415) and days to spike initiation (0.412). The number of cormels per plant had positive and significant correlation with number of leaves per plant (0.403), leaf width (0.320) and plant height (0.394). The number of corms per plant showed positive and significant correlation with plant height (0.640). Number of floret per spike has positive and significant correlation with spike weight (0.763), leaf width (0.634) and plant height (0.392). The weight of spike has positive and significant correlation with spike length (0.522), first floret to open (0.881) and leaf width (0.301). The length of spike has positive and significant correlation with spike initiation (0.358). The days first floret to open showed positive and significant correlation with days to spike initiation (0.647). Days to spike initiation showed positive and significant correlation with number of leaves per plant (0.834). The number of leaves per plant showed positive and significant correlation with leaf width (0.388).

Path co-efficient analysis showed at the phenotypic level in Table 3. Weight of spike (0.981) showed highest direct effects on corms weight per plant followed by number of corms per plant (0.8250), number of leaves per plant (0.3789) and spike initiation (0.3520).

Path co-efficient studies is a tool to observe the correlation into direct and indirect effect on yield and yield contributing components of gladiolus to provide clear picture of characters association for choosing effective selection strategy.

REFERENCES

Al-Jibouri, H.A., Miller, P.A. and Robinson, H.F. (1958). Genotypic and environmental variance and co-variance in upland cotton cross of interspecific origin. *Agron. J.,* **50**: 633-636.

Burton, G.K. and Devane, E.M. (1953). Estimating heritability in tall Fescue (Festuca arundinaceae) from replicated clonal material. *Agron. J.*, **45** : 478-481.

Deway, D.R. and Lu, K.H. (1959). A correlation and path co-efficient analysis of components of crested wheat grass seed production. *Agric. J.,* **51** : 515-518.

Hanson, C.H., Robinson, H.F. and Comstock, R.E. 1956. Biometrical studies on yield in segregating population of Korean lespedesa. *Agron. J.,* **48**: 268-272.

Johnson, H.W., Robinson, H.F. and Comstock, R.E. 1955. Estimation of genetic and environmental variability in soybeans. *Agron. J.*, **47** : 314-318.

Panse, V.G. and Sukhatme, P.V. (1967). *Statistical methods for agricultural workers*. 2nd Ed. ICAR. New Delhi, INDIA.