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VARIABILITY STUDIES IN GLADIOLUS

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Twelty five varieties (11 hybrids and 14 varieties as the respective parents of these hybrids) of gladiolus were used to study the variability for 16 characters. Heritability estimates and genetic advance were high for the characters like number of cormels produced per plant, weight of corms and cormels and propagation coefficient, leaf area, rachis length and number of seeds per capsule, showing additive gene effects. Thus the selection of the basis of these characters will be very effective for the improvement of this crop.

Key words: Gladiolus, variability, heritability, genetic advance, gene effect

Gladiolus is one of the best cut flower crop in the world. The improvement in this crop depends upon the variability for different characters present in this crop. The present study was undertaken to ascertain the extent of genetic variability by determmining the magnitude of genetic coefficient of variation, heritability estimates and genetic advance of the different characters of gladioli.

MATERIALS AND METHODS

Twenty five varieties of gladiolus consisting of 11 hybrids of indigenous origin, one variety each of Indian and Dutch origin and 12 from United States of America were grown in randomized block design with three replications during 1991-92 in the Division of Floriculture and Landscaping, IARI, New Delhi giving feeding area of 40 × 15 cm per plant and putting 10 corms (uniform size) per replication in one row where data were recorded only on six plants (leaving first two and last two plants in the row). The aspects of study were days for 50 per cent sprouting and flowering, days for last flowering, number of leaves and leaf area per shoot, diameter of the first flovet after two days of opening, number of florets per spike, plant height, rachis length, number of capsules per spike and number of seeds per capsule, number and weight of corms and cormels per plant and propagation coeffcient.

Standard statistical procedures were applied for calculation of genetic constants as described by Burton and De Vane (1953), Keller and Linkens (1955), Kneebone (1958) and Frakes *et al.* (1961). Heritability in broad sense was calculated according to the formula suggested by Hanson *et al.* (1956). Genetic advance was calculated as per formula suggested by Lush (1949) and Johnson *et al.* (1955) with 5 per cent select intensity. The data were analysed with the aid of computer.

RESULTS AND DISCUSSION

The difference among the varieties were found to be highly significant although the days for last floret opening, it was significant only at 5 per cent level (Table 1). For all these characters there was a wide range of phenotypic variability. Significant treatment differences between the varieties were discernible at 1 per cent level (Table 1). Significant block effects were seen for days for flowering, number of leaves per shoot, diameter of foremost floret, number of seeds per capsule, rachis length, average weight of aughter corm, number of florets per spike and number of capsules per shoot. The estimate of phenotypic (6^2 ph), genotypic (6^2g) and error (6^2e) variance of varietal means (Table 2) indicated variance to be very high for the characters like propagation coefficient followed by number of cormels aproduced per plant, leaf area and plant height. Misra and Saini (1988) also stated to have found high variance for number of cormels produced per plant.

The gcv ranged from 5.51 for number of days required for last flore opening to 93.54 for weight of a daughter corm (Table 2). The higher values for gcv were observed for the characters like number of cormels produced per plant, propagation coefficient, number of seeds per capsule, leaf area, number of capsules per shoot and average weight of a daughter corm whereas the components with low gcv were days for last floret opening, dys for floweing, number of leaves per shoot, diameter of foremost floret, days for sprouting, plant height, number of florets per spike, rachis length and number of corms produced per plant (Table 2) which is in line of the work of Misra and Saini (1988). By itself the gcv is not a correct measure to ascertain the heritable variations present, and should be considered together with the heritability estimates to obtain the best picture of the amount of advance to be expected from the selections (Burton, 1952), thus the heritable portion of the variation was ascertained with the help of heritability estimates which ranged from 32.7 for days to last floret opening to 99.0 for number of cormels produced per plant. Most of the characters possessed high heritability where important ones are plant height, days for flowering, rachis length, lead area, weight of cormels produced pe rplant, number of seeds per capsule, average weight of a daughter corm and number of florets.

Table 1. Analysis of variance for different characters in gladious

Characters	Range	Mean	F value	S.Em.
Days for 50% sprouting	5.60-12.47	10.07	5.84**	0.62
Days for initial flowering	98.93-138.84	121.54	106.40**	0.84
Number of leaves (excluding flag leaves) per shoot	6.12 - 8.39	6.81	6.95**	0.21
Leaf area (cm^2)	40.78 - 115.80	74.99	66.89**	2.26
Diameter of foremost floret after 2 days of opening	8.26 - 12.50	10.16	22.06**	0.25
Number of seeds per capsule	18.18-54.78	33.99	47.50**	1.44
Plant length (cm)	60.02- 106.25	82.48	118.05**	1.13
Rachis length (cm)	26.14 - 52.17	38.95	85.82*8	0.74
Days for last floret opening	113.99 - 159.88	133.75	2.45*	6.09
Number of corms produced per plant	1.00 - 2.51	1.59	3.82**	0.176
Average weight of a daughter corm (g)	19.00 - 54.97	35.54	34.97**	1.38
Number of cormels produced per plant	9.67 - 161.67	33.19	306.76**	1.77
Weight (g) of cormels produced per plant	1.57 - 17.86	5.98	48.3**	0.53
Propagation coefficient (%)	71.67 - 338.33	175.32	9.99**	20.42
Number of capsules per shoot	4.68 - 12.64	8.25	18.44**	0.54
Number of florets per spike	6.50- 15.05	11.87	31.56**	0.37

** P = 0.01, *P - 0.05

per spike. However, number of corms produced per plant showed low estimates of heritability followed by days for sprouting, number of leaves per shoot, propagation coefficient, number of capsules per shoot and diameter of foremost floret, while days for last floret opening had lowest heritability estimates (Table 2) which is contrary to the findings of Misra and Saini (1988) who reported lowest heritability estimates in plant height although studied the number of capsules formed per spike.

High heritability estimates are helpful in making selection of suprior genotypes on the basis of phenotypic performance of characters as has been reported by Johnson *et al.* (1955) on soybean that heritability estimates alongwith genetic grain is more useful than the heritability alone in predicting the resultnat effect for selecting the best individual. Present study showed a wide range of estimates of genetic advance i.e. 6.48 to days for last floret opening to 191.77 for number of cormels produced per plant which is in confirmity to the findngs of Misra and Saini (1988) as they also reported that number of cormels produced per plant expressed highest genetic advance. Apaprt from

Table 2. Variance, coefficient of variation, heritability and genetic advance for different characters in gladiolus

	Variance		Coefficient of variation		Herita-bility	Genetic advance as per cent of mean
	Pheno-typic (6^2ph)	Geno-typic (6^2g)	Pheno-typic (6^2e)	Geno-typic (gcv)		
Days for 50% sprouting	3.07	1.90	17.41	13.69	61.2	22.14
Days for flowering	79.38	77.19	7.33	7.23	97.2	14.68
Number of leaves per shoot	0.43	0.29	9.79	7.99	66.5	13.36
Leaf area (cm^2)	354.49	339.06	25.10	24.55	95.6	49.47
Diameter of foremost floret after two days of opening	1.56	1.37	12.34	11.55	87.5	22.24
Number of seeds per capsule	104.55	98.22	30.08	29.15	93.9	58.22
Plant height (cm)	156.80	152.89	15.18	14.99	97.5	30.49
Rachis length (cm)	49.56	47.87	18.07	1776	96.6	35.96
Days for last floret opening	165.81	54.22	9.36	5.51	32.7	6.48
Number of corms produced per plant	0.17	0.08	26.73	18.62	48.5	27.04
Average weight (g) of a daughter corm	70.81	65.07	23.68	22.69	91.9	44.82
Number of cormls produced per plant	973.40	963.95	94.00	93.54	99.0	191.77
Weight (g) of cormels produced per plant	14.76	13.89	64.21	62.28	94.1	124.58
Propagation coefficient (%)	5009.02	3756.45	40.37	34.98	75.0	62.36
Number of capsules per shoot	4.28	3.66	25.10	23.18	85.3	44.12
Number of florets per spike	4.83	4.40	18.53	17.68	91.1	34.79

this character the weight of cormels produced and the propagation coefficient expressed higher genetic advance followed by number of seeds per capsule,

leaf area, weight of a daughter corm and number of capsules per shoot (Table 2). Characters like number of leaves per shoot, days for flowering, days for sprouting, diameter of foremost floret and number of corms produced per plant showed lower estimated and the lowest percentage of genetic advance was recorded to days for last floret opening.

The characters like number of cormels produced per plant followed by weight of cormels per plant showed a very high genetic advance together with high heritability which reveals that high heritability obtained in these characters is probably due to additive gene effectes (Panse, 1957). The characters like number of seeds per capsule, leaf area and weight of a daughter corm had moderate high genetic advance accompanied by moderate to high heritability. The characters such as days for flowering, diameter of foremost floret, plant height, rachis length and number of florets per spike had high heritability values but a low genetic advance, suggesting that high heritability for these characters may have occurred due to non-additive gene action (Panse, 1957). The selection of individual plants for the characters number and weight of cormels and weight of corms per plant, propagation coefficient, number of seeds per capsule, number of capsules per spike and diameter of the foremost floret might therefore be effective which is in conformity to the findings of Misra and Saini (1988). Negi *et al.* (1982) also advocated selection criteria on the basis of number and weight of cormels and weight of corms produced per plant.

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