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CORRELATION, PATH COEFFICIENT ANALYSIS AND GENETIC DIVERSITY IN CLUSTERBEAN

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Thirty six genotically diversified clusterbean [*Cyamopsis tetragonoloba* (Linn.) Taub.] were studied for 10 metric traits during monsoon 1978 for the correlations, path coefficient analysis and genetic diversity. Seed yield/plant showed significant positive correlation with number of pods/plant, 100 seed weight, plant height, numder of branches/plant and number of clusters/plant. Similarly path coefficient analysis indicated the importance of number of pods/plant, 100 seed weight, which had maximum direct effect on seed yield. However, plant height, number of branches/plant and number of clusters/plant affected seed yield via pods/plant. Mahalanobis D^2 statistics was used to assess the genetic diversity among the genotypes which could be grouped in 5 clusters. The distribution of genotypes in different clusters was not according to their places of origin.

The present study was undertaken to study the type of association and to judge the direct and indirect effect of various quantitative traits on seed yield and to assess the genetic divergence among 36 varieties of clusterbean.

MATERIALS AND METHODS

Thirty six genotypes of clusterbean, collected from major geographical origin of our country, were raised during rainy season of 1978, in a randomized block design with 3 replications. The individual plot size was 3 rows of 3 m length, with plant spaced 15 cm apart. The inter-row distance was 45cm. The crop received a basal dressing @ 20 kg N/ha and 40 kg P/ha. Five plants were selected at random from middle row of each plot for recording observation on the following characters, viz., days to flowering initiation, days to 50% flowering, plant height (cm), number of branches/plant, number of clusters/plant, number of pods/plant, number of seeds/pod, 100 seed weight (g) and seed yield/plant (g). Phenotypic and genotypic correlations coefficient for all possible combinations were computed according to method given by Al-Jibouri (1958), path coefficients were worked out following Dewey and Lu(1959). The analysis of genetic divergence, using Mahalanobis's D^2 statistic, was carried out as described by Rao (1952). On the basis of the magnitude of the D^2 values, the varieties were grouped into a number of clusters as suggested by Torcher and described by Rao (1952).

RESULTS AND DISCUSSION

The estimates on genetic coefficient of variation (GCV), heritability (in broad sense), genetic advance and genetic gain between grain yield/plant and other metric traits are presented in Table 1. High values of GCV were recorded for characters like number of

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Table 1. Genetic coefficient of variation (GCV), Heritability per cent (H), Genetic advance as per ce of mean and genetic gain for different characters in clusterbean.

Characters	GCV	H(%)	GA	GG % of mean
Initiation of flowering (days)	7.5	93.1	6.2	15.0
50% flowering (days)	6.1	92.7	5.7	12.1
Maturity (days)	3.8	95.7	7.1	7.7
Plant height (cm)	10.3	71.8	13.4	18.0
No. of branches/plant	38.9	64.5	20.3	44.9
No. of clusters/plant	24.6	79.1	3.7	45.0
No. seeds/pod	1.9	23 9	0.2	2.0
100 seed weight (g)	6.6	83.4	0.4	12.5
No. of pods/plant	24.9	85.9	10.4	47.6
Grain yield/plant (g)	24.6	66.3	2.2	40.7

branches/plant number of pods/plant, grain yield/plant and number of clusters/plant indicating that judicious selection for these traits would lead to significant improvement. Similar results were reported by Tripathi and Lal, 1975. High heritability estimates were observed for characters like days to maturity, days to flowering initiation, days to 50% flowering, number of pods/plant, 100 seed weight, number of clusters/plant, suggesting that phenotypic selection for these traits would be close reflection of the genotype. Johnson *et. al.*, (1955) reported that heritability value along with genetic gain should be considered jointly to arrive at a more reliable conclusion.

The expected genetic advance expressed as per cent of mean was high in characters like number of branches/ plant, number of pods/plant and plant height. High values of heritability and genetic advance for these characters have been reported by Chaudhary and Singh, 1976. The genotypic and phenotypic correlation co-efficients between grain yield and 9 other metric traits have been presented in Table 2 It is to be noted that the genotypic correlation coefficients were higher than their corresponding phenotypic correlations. Earlier finding also reported similar results (Nath and Saini, 1980). Grain yield/plant was found to be positively correlated with plant height, number of branches/plant, number of clusters/plant. These findings are in agreement with earlier report by Nath and Saini, 1980. Among the component characters number of pods/plant was positively associated with maximum number of characters.

Path analysis for seed yield was carried out at genotypic level and is presented in Table 3. The direct effect of number of pods/plant was positive and highest on grain yield. The direct contribution of plant height, number of branches/plant and number of clusters were negative, whereas these characters has positive significant correlation with seed yield.. All these characters contributed most towards yield through number of pods/

Table 2. Genotypic (upper right) and phenotypic (lower left) correlation coefficient between 10 quantitative attributes in clusterbean.

Character	Days to flowering Initiation	Days to 50% flowering	Days to maturity	Plant height	No. of branches/ plant	No. of clusters/ plant	No. of seeds/ pod	100 seed seed weight	No. of pods/ plant	Grain yield/ plant
Days to flowering initiation	—	0.798**	0.256*	−0.057	0.076	−0.145	0.288*	−0.033	0.042	0.106
Days to 50% flowering	0.749**	—	0.467**	−0.076	0.032	−0.319**	0.129	0.083	−0.192	−0.082
Days to maturity	0.253*	0.436**	—	0.293*	0.054	−0.101	0.438**	0.434**	−0.181	−0.082
Plant height	−0.059	−0.043	0.245*	—	−0.182	−0.006	0.517**	0.439**	0.507**	0.586**
No. of branches per plant	0.050	0.036	0.051	−0.081	—	0.792**	−0.205	0.259*	0.437**	0.428**
No. of clusters per plant	−0.117	−0.285*	−0.094	0.019	0.574**	—	−0.053	0.096	0.593**	0.522**
No. of seeds/pod	0.149	0.032	0.202	0.229	0.028	−0.017	—	0.087	−0.006	−0.001
100 seed weight	−0.018	0.076	0.389**	0.355**	0.158	0.077	0.025	—	0.263*	0.542**
No. of pods/plant	0.036	−0.183	−0.175	0.421**	0.284*	0.486**	−0.019	0.221	—	1.025**
Grain yield/plant	0.073	−0.091	0.031	0.417**	0.375**	0.475**	0.034	0.397**	0.782**	—

* P = 0.05 ** P = 0.01

Table 3. Direct (diagonal) and indirect effects of yield components on grain yield in clusterbean.

Character	EFFECT VIA									
	Days to initiation of flowering	Days to 50% flowering	Days to maturity	Plant height	No. of branches/ plant	No. of clusters/ plant	No. of seeds/ pod	100 seed weight	No. of pods/ plant	Correlation with grain /yield
Days to initiation of flowering	—0.010	0 071	0.009	0.011	—0.015	0.001	0.003	—0.012	0.048	0.106
Days to 50% flowering	—0.008	0.089	0.015	0.015	– 0.003	0 001	0.031	0.029	—0.219	—0.082
Days to maturity	—0.003	0.042	0.033	—0.566	—0.011	0.0004	0.005	0.154	– 0.206	—0.043
Plant height	0.001	—0.007	0,010	—0.193	0.036	0.00002	0.006	0 155	0.579	0.583
Number of branches/ per plant	—0.001	0.003	0.002	0.035	—0.0196	—0.003	– 0.002	—0.092	0.499	0,428
No. of clusters/ plant	0.001	—0.028	—0.003	0.001	—0.155	—0.004	—0.001	0.034	0.677	0.522
No. of seeds/pod	—0.003	—0.011	0.015	—0.100	0.042	0.003	0.011	0.031	—0.007	—0.001
100 seed weight	0.0003	0.007	0.014	—0.035	– 0.051	—0.0004	0.001	0.354	0.300	0.542
No. of pods/plant	—0.0004	—0.017	– 0.008	– 0.098	– 0.086	—0.002	—0.0001	0 093	1.141	1.025

Table 4. Average inter and intra group D^2 values among 5 clusters comprising 36 varieties of clusterbean.

Cluster	I	II	III	IV	V
I	103.83	148.82	214.55	595.16	292.51
II		97.52	271.07	494.35	470.36
III			143.96	377.43	551.23
IV				—	1376.77
V					—

Table 5. Mean values of 5 clusters for 10 characters in clusterbean.

Characters	Clusters				
	I	II	III	IV	V
Days to flowering initiation	41.19	38.93	43.89	35.33	48.66
Days to 50% flowering	47.81	44.06	47.00	40.33	54.56
Plant height (cm)	74.16	78.09	73.28	48.33	71.25
No. of branches/plant	2.88	4.40	2.11	4.53	5.20
No. of clusters/plant	7.61	11.00	6.77	9.93	11.00
No. of seeds/pod	7.82	7.86	7.89	7.44	7.58
00 seed weight (g)	3.24	3.37	2.82	2.63	3.24
Pods/plant	20.56	27.74	22.41	16.93	20.53
Grain yield/plant (g)	5.08	7.20	4.77	3.02	5.02
Days to maturity	93.38	92.33	88.00	83.00	99.00

plant. 100 seed weight had second highest direct contribution towards seed yield/plant. However, this had also contributed substantially through number of pods/plant. These findings are in agreement with the findings of Sanghi and Sharma (1964), Chaudhary and Singh (1976). Thus the selection programe based on mainly number of pods/plant followed by number of branches/plant, plant height number of clusters/plant and 100 seed weight will lead to further improvement in clusterbean.

The 36 genotypes were clusters into 5 groups/clusters formed on the D^2 values (Table 4). Cluster I comprised the highest number of genotypes (=27), from Rajasthan and Gujarat, followed by II and III with 4 and 3 genotypes, from Rajasthan and Gujarat, respectively. Clusters IV and V contains only one genotype each, from Delhi and Rajasthan, respectively. Maximum statistical distance was observed between IV and V followed by I and IV, III and IV in that order while minimum was observed between I and II followed by I and III. The intra cluster distance was relatively low in cluster I, and I while high in cluster III (Table 4). Cluster II had high mean values for plant height, number of clusters plant;

umber of pods/plant, 100 seed veight and seed yield/plant; cluster II for number of seeds/pod, cluster / for days to flower initiation, days o 50% flowering, number of branches/plant, number of clusters/plant nd days to maturity (Table 5). The clustering pattern of the genotypes revealed that genetic diversity was not always related with geographical diversity. Similar report in clusterbean has been reported by Sohoo and Gill (1978). Genotypes belonging to the same state were found to be distributed in more than one clusters. It may, therefore, be concluded that genotypes from same state were found to be distributed in more than one clusters. It may, therefore, be concluded that genotypes from same state or geographical region had different genetic background as well as wide divergence in features and adaptability to rainfed conditions of the region. These results are also in agreement with the findings of Bhatt (1970) in wheat concluding that the genetic drift and selection could cause greater genetic diversity than the geographic distances. It would therefore be logical to effect crosses among the genotypes belonging to different clusters like IV and V and I and IV in order to evolve desirable high yielding lines suited to the rainfed conditions of the region

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