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ASSOCIATION, HERITABILITY AND GENETIC ADVANCE IN THE F_2 GENERATION OF WIDE AND VARIETAL CROSSES OF GREEN GRAM*

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The primary yield components viz; pods and clusters/plant and pods/cluster were correlated with each other and with yield/plant in all the crosses. Plant height had shown positive and significant correlation in all the wide crosses with pods/plant and clusters/plant, except in G 65 x *V. radiata* var *sublobata* while non-significant correlation was exhibited in varietal crosses for these pairs of characters. Seeds/pod was positively and significantly correlated with yield/plant in all the crosses. Seed size had shown positive and significant correlation with yield/plant in wide crosses, whereas non-significant correlation was exhihibited in the varietal crosses. The heritability estimates for 100 seed weight and pods/plants were high but it was lowesr for yield / plant. Pods and yield/plant had high genetic advance in the F_2 generation.

The studies on correlations heritability and genetic advance would provide a reliable information in formulating the breeding strategy. There are several reports in literature on these aspects in greengram (*Vigna radiata* (L). Wilczek). However, these studies have been conducted on germplasm lines/varieties and on the segregating populations obtained through varietal hybridization. There is no report of these genetic parameters using wide crosses *vis a vis* varietal crosses for yield and yield components in greengram. Therefore, the present investigation was taken up on the F_2's of the five wide crosses and two varietal crosses.

MATERIALS AND METHODS

The material consisted of six varieties/lines of greengram and one strain, type A of wild progenitor, *V. radiata* var. *sublobata*. Of the six cultivated types; T44 and G65 are released varities, ML33 and Hyb 4-3 are improved lines and L80 and LM293 are germplasm lines. The wild progenitor strain type A is found around Pantnagar University and is resistant to mungbean yellow mosaic virus. Five lines viz; L80, Hyb 4-3, G65, T44 and LM293 were crossed with wild progenitor as male in *Kharif* season of 1980, to get wide crosses. The two varietal crosess, ML33 x L80 and G65 x LM293 were also made in the same season. The F_1's were grown in glass house in the winter season to obtain F_2 seed. The F_2's were evaluated in *Kharif* season of 1981 in randomized block design in three replications. Each cross consisted of six row plot with row length of 3 m. The plant to plant distance was 10cm and inter-row

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distance was 60 cm. The observations were recorded on 40 randomly selected competitive plants from four central rows in each cross. The characters observed were plant height (cm), pods/plant, cluster/plant pods/cluster, seeds/pod, 100 seed weight (g) and yield/plant(g). The correlation coefficient (r) was calculated as per Singh and Chaudhary (1977). The heritability in broadsence was estimated as per Burton (1952) and expected genetic advance in per cent of mean was computed as suggested by Allard (1960).

RESULTS AND DISCUSSION

An understanding of the association of yield components with yield is of paramount importance in the breeding programme. The study of character association in the segregating generation from where the actual selection is made may be more useful to the breeder.

Plant height had shown significant correlation with pods and clusters/plant in all the wide crosses, except in G65 x *V. radiata* var *sublobata*. significant positive correlation of plant height with yield/plant was observed in the wide crosses of Hyb 4-3, T44 and LM 293 as female and wild progenitor as male, with pods/clusters in LM293 x *V radiata* var *sublobata* and with seeds/pod in Hyb 4-3 x *V. radiata* var *sublobata* crosses. Varietal crosses had exhibited non-significant correlation of plant height with all other characters, except with yield/plant in ML33 x L80 cross (Table 1). Most of the F_2 plants of the wide crosses were trailing in habit with more number of clusters and pods than the varietal crosses and therefore, resulted in positive and significant association of these traits with plant height.

Pods/plant exhibited significant and positive correlation with pods/cluster, cluster and yield/plant in all the wide and varietal crosses. It suggested that increase in number of pods/plant is due to clusters/plant and pods/cluster and ultimately yield *per se*. Singh and Malhotra (1970), Giriraj and Kumar (1974) and Singh and Singh (1973) found the similar results in mungbean. Pods/plant exhibited significant, positive correlation with seeds/pod in all the crosses, except in two wide crosses having G65 and T44 as female parent. The wide crosses also had the positive association between pods/plant and seed weight though it was significant in L80 x *V. radiata* var *sublobata* and G65 x *V. radiata* var *sublobata*. The varietal crosses had the negative and non-significant association between pods/plant and seed size.

Clusters/plant expressed positive, significant correlation with pods/cluster and seeds/pod in Hyb 4-3 x *V. radiata* var *sublobata*. with 100-seed weight and seeds/pod in L80 x *V radiata* var *sublobata* and in the varietal cross, ML 33 x L 80 (Table 1), All the wide and varietal crosses had positive and significant correlation between clusters and yield/plant.

Pods/cluster was significantly and positively correlated with seed/pod

and seed size in Hyb 4-3 x *V radiata* var *sublobata* with seed size in L80 x *V. radiata* var *sublobata*, T44 x *V. radiata* var *sublobata* and G65 x LM 293 and with seeds/pod in ML 33 x L80 cross. All the crosses had positive and significant association of pods/cluster and yield/plant (Table 1).

Seeds/pod was significantly and positively associated with seed size, only in a varietal cross (G65 x LM293). Seeds/pod had positive, highly significant association with yield/plant in all the crosses (Table 1).

Seed size had shown positive, significant correlation with yield/plant in all the wide crosses but the varietal crosses had non-significant correlations (Table 1). The differences in the magnitude of correlations in wide and varietal crosses could be ascribed to the more variability for these characters in wide crosses.

The extent of heritability in broad sense and genetic advance as per cent of mean obtained for different characters is presented in Table 2.

Seed size had the highest heritability value, suggesting that the character was least influenced by the environments. High heritability for seed weight was reported by Empig *et al.* (1970). The mean genetic advance for seed size was lowest, indiceting that high heritability does not accompany high genetic advance. ML33 x L80 and T44 x *V. radiata* var *sublobata* expressed highest heritability and genetic advance, respectively. Seeds/pod also showed the same trend. Hyb 4-3 x *V. radiata* var *sublobata* had highest heritability for genetic advance of 78.37 and 54.66 per cent, respectively for seeds/pod.

Pods/plant expressed the highest mean genetic advance (81.86 per cent) and high heritability (65.92 per cent). Clusters/plant exhibited high mean genetic advance (67.3 per cent) and moderate heritability (55.68 per cent L80 x *V. radiata* var *sublobata* and G65 x V. radiata var sublobata showed highest heritability for pods/plant and highest genetic advance for clusters/plant, respectively. Pods/cluster had moderate mean heritability (58.79 per cent) and genetic advance (49 76 per cent). LM293 x V. radiata var sublobeta showed highest heritability (79.09) per cent and genetic advance (68.48 per cent) for pods/cluster.

Plant height had moderote mean heritability (56.60 per cent) and genetic advance (44.29 per cent). LM293 x V. radiata var sublobata and G65 x V. radiata var sublobata expressed highest heritability (66.71 per cent) and genetic advance (74.91 per cent) respectively for this character.

The heritability value of yield / plant was lowest (44.94 per cent)

Table 1 : Correlation coefficients in the F_2 generation of wide and varietal crosses of greengram

Character combination	Cross						
	L 80 x *V. radiata* var *sublobata*	Hyb 4-3 x *V. radiata* var *sublobata*	G 65 x *V. radiata* var *sublobata*	T 44 x *V. radiata* var *sublobata*	LM 293 x *V. radiata* var *sublobata*	ML 33 x L 80	G 65 x LM 293
1	2	3	4	5	6	7	8
Plant height vs							
Pods per plant	0 276**	0 274**	0.125	0.366**	0.315**	0.063	0.163
Cluster per plant	0.359**	0.415**	0.134	0.364**	0.263**	0.092	0.031
Pods per cluster	0.130	0 040	0.013	0.037	0.216**	—0.046	—0.161
Seeds per pod	0.027	0.307**	—0.091	—0.009	0.064	—0.037	—0.175
100 seed weight (g)	0.112	0.075	0.054	0 072	—0.071	—0.144	—0.097
Yield per plant (g)	0.169	0 198*	0.096	0.212*	0.266**	0.181*	0.143
+ Pods per plant vs							
Clusters per plant	0.824**	0 839**	0.811**	0.801**	0.832**	0.911**	0.747**
Pods per cluster	0.524**	0.646**	0.348**	0 449**	0.346**	0.315**	0.555**
Seeds per pod	0.330**	0 348**	0.030	0.022	0.292**	0.380**	0.208**
100 seed weight (g)	0.354**	0.007	0.182**	0.106	0 036	-0.075	—0.030
Yield per plant (g)	0.848**	0.804**	0.676**	0.747**	0.848**	0.925**	0.832**
Clusters per plant vs							
Pods per cluster	0.043	0.215*	—0.125	—0.081	—0.099	0.015	—0 081
Seeds per pod	0.372**	0.339**	0.105	0 157	0.305**	0.330**	0.157
100 seed weight (g)	0.255**	—0 099	—0.127	—0.046	0.054	-0.084	—0.038
Yield per plant (g)	0 688**	0.706**	0.569**	0.605**	0.764**	0.861**	0.689**

1	2	3	4	5	6	7	8
Pods per cluster vs							
Seeds per pod	0.030	0.202*	—0 074	—0.095	—0.015	0.236**	0.101
100 seed weight (g)	0.299**	0.153	0.025	0.263**	0.076	0 074	0 220*
Yield per plant (g)	0.420**	0.478**	0.218*	0 357**	0.233**	0.243**	0.411**
Seeds per pod vs							
100 seed weight (g)	0.151	0.068	0 070	0.053	0.107	0.080	0.225**
Yield per plant (g)	0.463**	0 507**	0.333**	0.393**	0.544**	0.382**	0.313**
100 seed weight vs							
Yield per plant (g)	0.456**	0.216*	0.422**	0.406**	0.433**	0.016	0.069

*, **Significant at 5 and 1 percent level of probability, respectively.

Table 2 : Range and mean of heritability (in percent) and genetic advance (in percent of mean) and the crosses showing highest heritability and genetic advance.

Character	Heritability (in percent)		Genetic advance in percent of mean		Cross showing highest	
	Range	Mean	Range	Mean	Heritability	Genetic advance
Plant height (cm)	47.52-66.71	56.60	19.74-74.91	44.29	LM 293 x *V. radiata* var *sublobata*	G 65 x *V. radiata* var *sublobata*
Pods per plant	41.96-83.92	65.92	45.15-99 35	81.86	L 80 x *V. radiata* var *sublobata*	G 65 x *V radiata* var *sublobata*
Clusters per plant	30.85-74.79	55.68	30.98-96 63	67.30	L 80 x *V. radiata* var *sublobata*	G 65 x *V. radiata* var *sublobata*
Pods per cluster	40.50-78-09	58.79	27 81-68.48	49.76	LM 293 x *V. radiata* var *sublobata*	LM 293 x *V. radiata* var *sublobata*
Seeds per pod	42.99-78.37	63.00	15.71-54 66	37.40	Hyb. 4-3x*V. radiata* var *sublobata*	Hyb. 4-3x *V. radiata* var *sublobata*
100-seed weight (g)	54.00-86.71	69.53	15.98-47.09	28.46	ML 33 x L80	T44 x *V. radiata* var *sublobata*
Yield per plant (g)	20.19-67.11	44.94	40.90-95 86	68.30	ML 33 x L 80	ML 33 x L 80

among all seven characters, which indicated that yield per se was highly influenced by the environmental conditions as compared to the yield components. Yohe and Poehlman(1975) reported low heritability for this character. The range of heritability in this investigation was 20.19 to 67.11 per cent. Empig *et al.* (1970) had observed heritability for yield as low as 8.6 per cent in the F_2 population of mungbean The mean genetic advance was 68.30 per cent, which ranked second highest among the seven characters. The range of genetic advance was 40.90 to 95.86 per cent.

Highest heritability coupled with highest genetic advance was observed in Mi 33 x L80 for yield / plant, in LM293 x V radiata var sublobata for pods / cluster, and in Hyb 4-3 x V. radiata var sublobata for seeds / pod. Hence, these crosses were best for selection in the F_2 generation to their respective characters.

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REFERENCES

ALLARD, R. W. 1960. Principles of Plant Breeding. John Willey and Sons, Inc., New York, pp. 485.

BURTON, G. W. 1962. Quantitative inheritance in grasses. Proc. *VI Int. Grassld. Congr.* 1 : 277-283

EMPIG, L. T., R. M. LANTICAN and P. B. ESCURO 1970. Heritability estimates of quantitative characters in mungbean (*Phaseolus aureus* Roxb.) *Crop Sci.* 10 : 240-241

GIRIRAJ, K. and V. S. KUMAR 1974. Path-coefficient and analysis of yield attributes in mungbean. *Indian J. Genet. Pl. Breed.* 34 : 460-468.

SINGH, K. B. and R. S. MALHOTRA 1970. Interrelationship between yield and yield components in mungbean. *Indian J. Genet. pl. Breed* 30 : 244 250.

SINGH, R. K. and B. D. CHAUDHARY 1977. Biometrical methods in quantitative genetic analysis. Kalyani Publishers, New Delhi pp. 288.

SINGH, T. P and K. B. SINGH 1973. Association of grain yield and its components in the segregating populations of greengram. *Indian J. Genet. pl Breed.* 33 : 112-117.

YOHE, J. M. and J. M. POEHLMAN, 1975. Regression, correlation and combining ability in mungbean (*Vigna radiata* (L.) Wilezek). *Trop. Agric.* 52 : 343-352.