Table 2. Direct and indirect effects of different characters with yield

	Days to 50% flowering	Plant height	No. of productive tillers	Ear length	Ear thickness	1000 grain weight	Genotypic correlation coefficien
Days to 50% flowering	**-0.1184**	0.0606	0.1401	0.1194	-0.0049	-0.0002	0.1967
Plant height	-0.0576	**0.1246**	-0.0795	0.2576	-0.0053	-0.0001	0.2398*
Number of productive tillers	-0.0231	-0.0138	**0.7189**	-0.1453	0.0061	-0.0003	0.5426**
Ear length	-0.0339	0.0769	-0.2504	**0.4170**	-0.0087	-0.0001	0.2009
Ear thickness	-0.0244	0.0272	-0.1807	0.1506	**-0.0241**	0.0001	-0.0514
1000 grain weight	-0.0163	0.0059	0.1849	0.0509	0.0009	**-0.0013**	0.2250*

Residual : 0.7201

association between independent and dependent variables (Table 2) which indicated that number of productive tillers having maximum correlation with grain yield also exhibited very high direct effect. Raveendran and Appadurai (1984) and Borle and Patil (1991) also revealed that productive tillers per plant contributed positive direct effect on grain yield. The trait plant height having positive correlation with grain yield exhibited direct and also high indirect effect *via.*, ear length. Borle and Patil (1991) also reported direct contribution of plant height to grain yield. The above study revealed that the number of productive tillers per plant, plant height and 1000 grain weight are the most important traits which affected grain yield and should be given maximum emphasis during selection for the improvement of grain yield in pearl millet hybrids.

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VARIATION AND CHARACTER RELATIONSHIP IN GREEN GRAM X BLACK GRAM DERIVATIVES

P. NAGARAJAN and S.R. SREE RANGASAMY

Centre for Plant Breeding and Genetics
Tamil Nadu Agricultural University
Coimbatore 641 003

ABSTRACT

Four hundred and eighty six derivatives of green gram x black gram showed high magnitude of variability for plant height, number of pods per plant, seed yield, number of cluster, number of branches and pod yield. Moderate variability was found for pods per cluster, pod length, seed/pod and root length. Highly significant and positive association of seed yield with pod per cluster and pod yield ; pod yield with number of pods ; plant height with seeds per pod and number of branches with pod length and root length was found in the set of materials.

KEY WORDS : Variability, correlation, black gram x green gram derivatives

Table 1. ANOVA for augmented design

Characters	Mean square			
	Blocks (19)	Checks (5)	Lines (486)	Error (95)
Plant height (cm)	96.32	4222.22**	728.90**	153.00
Root length (cm)	7.04	265.53**	793.87**	4.51
No. of branches	7.06	3.46	404.53**	3.41
No. of clusters	29.73	266.41**	22.25**	34.03
Pods per cluster	61.07	37.16	58.70**	58.53
No. of pods	316.45	2243.91**	489.04**	205.06
Pod length (cm)	0.39	28.40**	232.50**	0.79
Seed per pod	2.31	73.46**	63.32**	3.22
Pod yield (g)	99.72	202.73**	92.07**	59.58
Seed yield (g)	6.91	84.88**	18.75**	11.99

Figures in the parantheses represent the degrees of freedom ** - Significant at one per cent level,

The amount of variability for important economic traits of any crops limits the progress that can be achieved through selection. An assessment of variability is, therefore, required to judge its potential as base material for genetic improvement. Further, direct seed selection for complex traits such as yeild is not effective. Knowledge of association of [illegible] simply inherited traits, which are less affected by environment, is required to construct the suitable selection criteria. Thus, the present investigation was aimed at obtaining information on variability, nature and magnitude of trait association in population of the green gram x black gram derivatives.

MATERIALS AND METHODS

Four hundred and eighty six lines derived from 202 families of green gram and black gram derivatives of four cross combinations in the F4 generation and their parents were evaluated in an augmented design during *kharif* 1993 at Pulses Breeding Station, Tamil Nadu Agrl. University, Coimbatore. They were raised in 20 blocks, with 4.0 x 7.5 m^2. Each line was raised in a single row of 4m length by adopting 30 x 10 cm spacing. Six checks, *Viz.*, green gram Co 3 and GD-1-47-4 and black gram Co 5, COBG10, Vamban 1 and T9 were raised at random in each block. The other cultural practices were uniformly adopted for the entire crop period. Observations were recorded for 10 traits, *Viz.*, plant height, root length, number of branches, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length, number of seeds per pod, pod yield and seed yield. Analysis of the data was done in an augmented design and adjusted mean values were used to assess the range, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (h^2) and genetic advance as percentage of mean and simple coefficient of variation.

RESULTS AND DISCUSSION

The analysis of variance (Table 1) indicated that differences between the derivatives from four cross combinations of green gram x black gram for all the traits studied, were significant which could

Table 2. Variability parameters for ten metric traits in green gram X black gram derivatives

Characters	Mean	Range	PCV	GCV	h^2	GA %
Plant height (cm)	62.13	21.00-115.00	52.49	42.83	66.57	71.99
Root length (cm)	12.87	6.10-19.50	73.67	41.17	64.73	98.20
No. of branches	3.07	1.20-7.90	70.01	49.60	50.20	72.30
No. of clusters	6.88	3.20-26.02	40.28	27.77	47.53	39.38
Pods per cluster	4.88	3.50-9.00	34.41	24.42	50.35	35.66
No. of pods/plant	35.74	13.50-122.00	28.86	17.31	35.95	21.32
Pod length (cm)	4.10	0.50-6.42	44.17	36.98	70.12	63.66
Seeds per pod	6.06	1.20-7.50	34.20	25.72	56.51	19.31
Pod yield (g)	12.89	0.25-30.00	35.21	27.32	34.09	32.89
Seed yield (g)	10.70	0.19-28.84	66.66	52.62	63.30	41.49

Table 3. Inter relation among the components in green gram X black gram derivatives

Characters	Root length	No. of branches	No. of clusters	Pods/ cluster	No. of pods	Pod length	Seeds/pod	Pod yield	Seed yield
Plant height	0.2750**	-0.3603**	0.3548**	- 0.0872	0.6634**	-0.2735**	-0.1001	0.1711**	-0.0407
Root length		-0.0157	-0.2918**	-0.0549	-0.3198**	0.5684**	-0.5247**	0.0892	0.0452
No. of branches			-0.0877	0.0653	-0.1829**	-0.0862	0.4992**	0.0087	-0.0402
No. of clusters				-0.0130	0.4265**	-0.1220*	0.0799	0.3706**	-0.0374
Pods/cluster					-0.1269**	0.1163*	-0.0089	-0.0618	0.5505**
No. of pods						-0.3329**	0.0816	0.3592**	-0.0483
Pod length							0.4092**	-0.1256*	0.0214
Seeds per pod								- 0.0429	-0.1613**
Pod yield									0.1225**

* - Significant at 5% level ; ** - Significant 1 % level

facilitate a high scope for selection on specific characters for further improvement. The differences among the blocks were not significant for all the traits indicating that experimental plots were statistically homogeneous among themselves. Singh and Mishra (1993) indicated similar conclusions in Oats. High PCV and GCV was observed in plant height, root length, number of branches, pod length and seed yield suggested the selection based on these characters would facilitate successful isolation of desirable types (Table 2). Similar findings were reported by many workers. However, the genetic variability together with heritable estimates would give a better idea on the amount of genetic advance expected from selection (Burton, 1952). Plant height, number of branches pod length and seed yield showed high heritability coupled with high GCV suggesting a greater scope for selection and it will have direct bearing on constructing desirable plant type (ideotype) through appropriate breeding strategies. Johnson *et al.*, (1995) suggested that heritability in combination with GA was more reliable in predicting the effect of selection, and it is mainly attributable to the action of additive gene. In the present investigation, high GCV and heritability estimates associated with greater GA were observed for plant height, root length, number of branches, pod length and seed yield.

Study of association among economic traits is useful in understanding the favourable and unfavourable relations among them but it acts as a guideline in the selection of high yielding individual plants on the basis of certain yield components. In the present investigation, the simple correlation coefficients among the traits are presented in Table 3. Seed yield had positive correlation with pods per cluster and pod yield. Indicating that selection based on these traits will result in improving the yield. Similar results were reported by many workers (Renganayaki and Sree Rangasamy, 1993 ; Ganesh Ram, 1993). The inter relationship among the yield components *viz.*, pod yield, number of pods and plant height ; seeds per pod and number of branches ; pod length and root length were with significant and positive correlation among themselves. It indicated that simultaneous improvement of these traits could be effected by selection. The findings from the present investication indicated that for increasing the grain yield, the simultaneous selection should be based upon the traits like plant height, root length, number of branches and pod length.

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