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Genetic Estimates, Association and Path Co-efficient Analysis in Blackgram (*Vigna mungo*.(L.)Hepper)

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ABSTRACT

Forty one divergent genotypes of blackgram (*Vigna mungo*.(L) Hepper) were evaluated for the yield and yield attributes during *rabi*, 2009-10. Genotypes differed significantly for all the characters studied. Plant height, number of clusters plant^{-1}, number of pods plant^{-1}, pod length and seed yield plant^{-1} expressed high genetic advance as percentage of mean (GAM) coupled with high to moderate heritability and genotypic coefficient of Variation, indicating there by the preponderance of additive gene action for these characters. Correlation analysis indicated that seed yield /plant was significantly associated with number of branches plant^{-1}, number of pods plant^{-1}, pod length and number of seeds/pod. Path co-efficient analysis revealed that plant height, number of branches plant^{-1}, number of pods plant^{-1}, pod length, number of seeds pod^{-1} and 100-seed weight had positive direct effects on seed yield plant^{-1}. Hence, selection on these traits could be suggested to bring improvement on seed yield in blackgram.

Key words : Blackgram, Character Association, Genetic Variability, Path Analysis.

One of the important considerations in any crop improvement programme is the detailed study of genetic variability. The estimates of heritable and non-heritable variance give a clue on improvement possible for the character under study. Association studies give an idea about the combination of different characters towards yield. Seed yield is a complex character and is associated with number of component characters which are themselves interrelated. Such interdependence often affects their relationship with yield, there by making correlation ineffective. So, there is a need to partition the correlations into direct and indirect effects to get the information about the actual contribution of each character to seed yield. Therefore, the present study was undertaken to study the association and interrelationships of different yield attributes in the selected genotypes of blackgram.

MATERIAL AND METHODS

The experimental material comprised of 41 diverse genotypes of blackgram were grown at Agricultural Research Station, Podalakur during *rabi*, 2009-10 following Randomized Block Design with three replications. Each genotype was accommodated in six rows plot of five meters length with 30 cm and 10 cm, as inter and intra row spacing, respectively. Recommended package of practices were followed to raise the crop. The data was recorded on ten randomly sampled plants from each entry for characters *viz.*, plant height, number of branches plant^{-1}, number of clusters plant^{-1}, number of pods plant^{-1}, pod length, number of seeds pod^{-1},100-seed weight and seed yield plant^{-1}. The mean values of genotypes were used to estimate genetic parameters as per the procedure suggested by Singh and Choudhary (1977). The genotypic and phenotypic correlations were determined as per Johnson *et al.* (1955). Path coefficient analysis was done as suggested by Wright (1921) and as described by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The analysis of variance revealed that the differences among the varieties were significant for all the characters. Estimates of components of variance, heritability in broad sense and genetic advance of eight characters are presented in Table 1. The results indicated that the relative magnitude of phenotypic coefficient of variation (PCV) was higher than the corresponding genotypic coefficient of variation (GCV) for number of branches plant^{-1}, pod length, number of seeds pod^{-1}, 100-seed weight and seed yield plant^{-1}, which indicated the influence of environment on these characters. The trait, number of branches plant^{-1} recorded the highest GCV, followed by number of pods plant^{-1}, number of clusters plant^{-1} and seed yield plant^{-1}. The efficiency of selection procedure is more appropriate only when the parents having a high variability for the

Table 1. Genetic parameters for eight characters in blackgram

Sl.No.	Character	Mean	Range	Variance		Coefficient of Variation		Heritability Broad sense (%)	Genetic advance (GA)	Genetic advance as percent of mean (%)
				Genotypic	Phenotypic	Genotypic	Phenotypic			
1	Plant height (cm)	36.12	22.4 – 69.9	153.90	156.23	34.34	34.60	98.52	25.36	70.20
2	No. of branches plant^{-1}	1.98	1.0 – 7.4	1.52	2.30	62.90	76.59	66.00	2.06	103.70
3	No. of clusters plant^{-1}	7.49	4.4 – 12.9	7.03	1.19	35.36	35.81	97.50	5.38	71.90
4	No. pods plant^{-1}	19.29	11.4 – 39.2	51.71	52.63	37.28	37.61	98.25	14.68	76.10
5	Pod length	4.99	3.9 – 13	2.82	3.31	33.53	38.50	84.59	3.17	63.50
6	No. seeds pod^{-1}	8.91	5.6 – 8.5	0.45	0.63	9.75	11.46	72.32	1.18	17.07
7	100-seed weight (g)	4.55	3.5 – 5.4	0.17	0.19	8.99	9.50	89.30	0.80	17.60
8	Seed yield plant^{-1} (g)	4.61	1.5 – 7.3	2.88	4.15	36.81	44.12	69.40	2.91	63.17

desirable characters, which are heritable in nature. It was suggested by Burton (1952) that GCV together with heritability estimates would give the best scope for getting desirable characters through selection of parents for hybridization. Heritability (broad sense) was also found higher for all the characters. Such high level of heritability may be due to the control of additive gene action in expression of these characters.

Johnson *et al.* (1955) opined that heritability estimates along with genetic gain is more useful than heritability alone in predicting the resultant effect of selection. In the present study, high genetic advance as percentage of mean (GAM) coupled with high to moderate heritability was observed in characters namely plant height, number of branches plant^{-1}, number of clusters plant^{-1}, number of pods plant^{-1}, pod length and seed yield plant^{-1}. This suggested that preponderance of additive gene action with low environmental influence for the determination of these characters and could be effective in phenotypic selection. The characters 100-seed weight and number of seeds pod^{-1} exhibited high heritability with low GAM which indicates the influence of may be due to non-additive gene action. Moderate heritability coupled with high GAM was observed for number of branches plant^{-1}, which revealed the importance of both additive and non- additive gene actions in the inheritance of this trait. Similar observations were reported in blackgram by Parameswarappa and Laminani (2005), Pradhan and Misra (2008) and Konda *et al.* (2009)

Estimates of correlation coefficients at genotypic and phenotypic levels were presented in Table 2. In general, the genotypic correlation coefficients were higher than phenotypic correlations, which might be due to the masking effect of environment in genetic association between the characters (Johnson *et al.,* 1955). The correlation of the yield and yield contributing characters

Table 2. Phenotypic (P) and genotypic (G) correlation coefficients in blackgram genotypes

Characters		Plant height	No. of branches plant^{-1}	No. of clusters plant^{-1}	No. of pods plant^{-1}	Pod length	No. of seeds pod^{-1}	100-seed weight	Seed yield plant^{-1}
Plant height	P	1.000	0.289	0.194	0.111	-0.199	0.059	0.214	0.266
	G	1.000	0.300	0.213	-0.250	-0.249	0.038	0.251	0.224
No. of branches	P		1.000	0.504**	0.277	-0.127	0.493	0.320*	0.356*
plant^{-1}	G		1.000	0.568**	0.268	-0.147	0.496**	0.351*	0.431*
No. of clusters	P			1.000	0.660**	-0.415**	0.075**	0.030	0.054
plant^{-1}	G			1.000	0.749**	-0.518**	0.051	0.027	0.057
No. of pods	P				1.000	0.593**	0.807**	0.053	0.766**
plant^{-1}	G				1.000	0.644**	0.848**	0.069	0.876**
Pod length	P					1.000	0.355*	0.037	0.485**
	G					1.000	0.373*	0.029	0.517**
No. of seeds	P						1.000	0.233	0.703**
pod^{-1}	G						1.000	0.299	0.822**
100-seed weight	P							1.000	0.046
	G							1.000	0.083
Seed yield	P								1.000
plant^{-1}	G								1.000

* Significant at 5% level ** Significant at 1% level

Table 3: Phenotypic (P) and genotypic (G) path coefficients for seed yield/ plant in blackgram

Characters		Plant height	No. of branches plant^{-1}	No. of clusters plant^{-1}	No. of pods plant^{-1}	Pod length	No. of seeds pod^{-1}	100-seed weight	Correlation with Seed yield plant^{-1}
Plant height	P	**0.038**	0.019	-0.006	0.011	0.019	0.167	0.018	0.266
	G	**0.042**	0.010	-0.003	-0.002	0.018	0.147	0.012	0.224
No. of branches	P	0.011	**0.033**	-0.015	0.009	0.005	0.306	0.007	0.356
plant^{-1}	G	0.013	**0.034**	0.058	0.024	0.010	0.283	0.017	0.431*
No. of clusters	P	0.008	0.016	**-0.029**	-0.006	0.018	0.046	0.001	0.054
plant^{-1}	G	0.009	0.090	**-0.015**	-0.022	0.036	0.029	0.001	0.057
No. of pods	P	0.051	0.062	0.045	**0.102**	-0.025	0.500	0.031	0.766**
plant^{-1}	G	0.074	0.089	0.065	**0.165**	-0.065	0.485	0.063	0.876**
Pod length	P	-0.008	-0.004	0.012	0.020	**0.243**	0.221	0.001	0.485**
	G	-0.010	-0.015	0.008	0.059	**0.270**	0.204	0.001	0.517**
No. of seeds	P	0.021	-0.026	-0.002	0.028	-0.015	**0.620**	0.025	0.703**
pod^{-1}	G	0.051	0.087	-0.001	0.077	-0.026	**0.572**	0.062	0.822**
100-seed weight	P	0.008	0.011	-0.001	0.022	-0.002	0.005	**0.023**	0.046
	G	0.011	0.012	-0.001	0.006	-0.002	0.012	**0.045**	0.083

Phenotypic Residual effect: 0.015 Genotypic Residual effect: 0.008

* Significant at 5% level ** Significant at 1% level

Bold : Direct effects

indicated that seed yield plant^{-1} was positive and significantly influenced by number of branches plant^{-1}, number of pods plant^{-1}, pod length and number of seeds pod^{-1}. Parameswarappa and Laminani (2005), Konda *et al.* (2008) and Umadevi and Ganesan (2006) reported similar findings for number of branches plant^{-1}, number of pods plant^{-1}, pod length and number of seeds pod^{-1}. Interestingly, these characters were also positive and significantly correlated with each other. Therefore, the positively correlated yield attributes, number of branches plant^{-1}, number of pods plant^{-1}, number of seeds pod^{-1} and pod length should be considered as crucial parameters for selection in breeding programmes targeted for high yield in blackgram. The path analysis (Table 3) revealed that number of seeds pod^{-1}, pod length, number of pods plant^{-1}, plant height, number of branches plant^{-1} and 100-seed weight had positive direct effects on seed yield plant^{-1}, whereas negative direct effect was registered by number of clusters plant^{-1}. Number of seeds pod^{-1} had the highest direct positive effects on seed yield plant^{-1}. Indirect effects of all characters *via* number of seeds pod^{-1} were found to be positive and very high in magnitude.

An overall observation of variability and association analysis led to the conclusion that number of branches plant^{-1}, number of pods plant^{-1}, number of seeds pod^{-1} and pod length are the main component characters influencing seed yield. Therefore, direct selection on the basis of these traits could be very effective to improve seed yield in blackgram.

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