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Variability and correlation of grain quality traits in blackgram (*Vigna mungo* (L.) Hepper)

M.UMADEVI AND N.MEENAKSHI GANESAN
Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore-641 003.

Abstract: **A field experiment was conducted during rabi 2000 at Tamil Nadu Agricultural University, Coimbatore to evaluate the variation and correlation of grain quality characters. All the genotypes revealed high significant variability for the six quality characters studied. High heritability coupled with high genetic advance was observed for final batter volume. The association study of different quality characters indicated that grain yield was significantly associated with apparent grain volume.**

Key words: blackgram, correlation, quality characters, protein.

Introduction

Next only to the cereal crops, pulses remain as an importance source of protein to meet perhaps the most important nutritional need of people in the developing countries like India. Among pulses, blackgram is one of the important grain legumes. This crop is a highly priced crop and the grain is rich in phosphoric acid. The state and national programme on the improvement of pulses emphasized the urgency of generating variability for high genetic potential. It is essential to understand the genetic architecture of the varieties and nature of gene action governing yield and its component traits to increase the yield per unit area. Hence, the present study was carried out to assess the genetic improvement of black gram for grain yield and quality characters.

Materials and methods

Sixty genotypes of blackgram were used for the present study. The genotypes were sown in rabi 2000 at Millets and Pulses Breeding Station, Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out in randomized block design with three replications with a spacing of 30cm x 15cm. Observations were recorded on five randomly selected plants of each genotype in all replications for protein content, apparent grain volume, initial batter volume, raise in batter volume and final batter volume and seed yield per plant. For the estimation of protein, the seed sample was obtained by selecting seeds from each plant at random and the total nitrogen content was estimated by following Microjeldhal method of Humphries (1956) and the content of nitrogen was multiplied by the factor 6.25 to obtain crude protein content and expressed in g/100g of seed on moisture free basis.

The genotypic and phenotypic variance and heritability in the broad sense was estimated by Lush (1940). The range of heritability was categorized as suggested by Robinson *et al.* (1949). The association between yield and component traits and among themselves was computed based on genotypic and phenotypic correlation coefficients (Goulden, 1952).

Results and Discussion

Yield is a complex trait and in order to achieve a higher level of yield, the understanding of the intricate nature and association of yield contributing characters is a must in any crop. Among the grain pulses, blackgram is unique in its utilization pattern. The major products prepared from the grain are the unique South Indian foods like idli, dosai, blackgram vada and appalam and genetic variability studies on the grain quality characters of blackgram are very much limited.

Table 1. Estimates of variability and genetic parameters of 60 genotypes of blackgram

Sl. No.	Characters	Mean	PCV %	GCV %	Heritability	Genetic advance	GA as % of mean
1.	Grain yield (gm)	8.85	12.89	12.81	98.70	2.32	26.21
2.	Protein content (%)	21.16	6.53	6.23	91.10	2.59	12.25
3.	Apparent grain volume (ml)	73.16	5.09	4.04	62.70	4.81	6.58
4.	Initial batter volume (ml)	491.72	7.95	7.66	92.80	74.98	15.19
5.	Raise in volume (ml)	588.92	15.41	14.95	94.90	175.70	29.84
6.	Final batter volume (ml)	414.33	16.47	16.35	98.70	138.63	33.46

Table 2. Correlation among quality characters and grain yield

Sl. No.	Characters		Protein content	Apparent grain volume	Initial batter volume	Raise in volume	Final batter volume	Grain yield
1.	Protein content	G	**1.000**	-0.277*	0.055	-0.124	-0.068	0.007
		P	**1.000**	-0.164	0.048	0.094	-0.044	-0.003
2.	Grain volume	G		**1.000**	0.249	0.223	0.035	0.595**
		P		**1.000**	0.103	0.122	0.012	0.323*
3.	Initial batter volume	G			**1.000**	0.341**	0.300	-0.057
		P			**1.000**	0.325*	0.269*	-0.051
4.	Raise in volume	G				**1.000**	0.875**	0.192
		P				**1.000**	0.840*	0.184
5.	Final batter volume	G					**1.000**	0.084
		P					**1.000**	0.080
6.	Grain yield	G						**1.000**
		P						**1.000**

* Significant at 5% level ** Significant at 1% level
G - Genotypic correlation P = Phenotypic correlation

The variability and genetic parameters of six traits estimated during rabi are presented in Table 1. The GCV per cent was found to be less than PCV per cent for all the traits studied. The maximum PCV (16.47%) and GCV (16.35%) were observed for final batter volume. The minimum PCV (5.09%) and GCV (4.04%) were recorded for apparent grain volume. The GCV per cent of protein content was 6.23%. This trait had high heritability and moderate genetic advance as percentage of mean indicating the governance of this character by additive genes and possibility of exploitation of this character by pedigree breeding. The raise in batter volume and final batter volume showed high GCV per cent indicating the presence of high genetic variability the presence of additive gene in controlling this trait. Similar results

Table 3. Mean performance of 60 genotypes of blackgram for grain quality characters

Genotype	Protein content %	Apparent grain volume ml / 50g	Batter volume ml / 50g	Raise in volume ml / 50g	Final volume ml/ 50g
AC210	19.60	78.33	486.67	576.67	363.33
AC227	22.50	74.00	513.33	600.00	413.33
AC264	20.80	73.00	506.67	573.33	390.00
AC287	21.63	72.33	506.67	560.00	353.33
AC291	20.93	80.67	423.33	550.00	350.00
AC43	20.10	70.67	493.33	756.67	463.33
AC218	21.60	71.33	493.33	540.00	346.67
AC267	23.33	70.67	493.33	520.00	390.00
Co 2	20.60	70.67	506.67	543.33	413.33
Co 4	22.77	79.33	560.00	620.00	433.33
Co 5	20.97	70.67	450.00	763.33	513.33
COBG 593	22.83	70.67	413.33	670.00	453.33
Composite	19.83	74.00	493.33	536.67	390.00
LABBG 226	22.33	70.67	513.33	636.67	413.33
LU 162	22.33	68.67	486.67	563.33	383.33
LU222	19.87	70.67	493.33	566.67	383.33
LU 246	18.60	78.33	493.33	553.33	340.00
LU 249	18.70	71.33	506.67	560.00	356.67
Ml	21.13	72.33	493.33	536.67	390.00
M10	22.10	72.33	493.33	526.67	346.67
Mahesan	24.30	68.67	493.33	526.67	390.00
Mavalore	18.87	74.00	486.67	530.00	450.00
P131	23.13	70.67	493.33	550.00	346.67
P 132/1	21.70	72.33	440.00	530.00	350.00
P 133/1	21.13	79.33	506.67	633.33	406.67
P 133/18	20.50	80.00	460.00	743.33	506.67
P 133/27	21.70	70.67	523.33	700.00	570.00
Pl 33/32	21.10	78.33	580.00	886.67	656.67
P136	19.67	88.33	506.67	526.67	373.33
P177	19.93	78.33	493.33	673.33	446.67
P2	19.37	70.67	513.33	640.00	416.67
P206	22.67	71.33	513.33	746.67	513.33
P209	21.67	70.67	460.00	553.33	380.00
P227	21.73	79.33	593.33	656.67	433.33
P231	22.23	72.33	493.33	580.00	416.67
P238	20.27	70.67	470.00	536.67	410.00
P287	21.70	80.00	506.67	533.33	360.00
P30	22.13	81.00	506.67	526.67	343.33

(Contd...)

Table 3. (Contd..)

Genotype	Protein content %	Apparent grain volume ml / 50g	Batter volume ml / 50g	Raise in volume ml / 50g	Final volume ml/ 50g
P30/1	23.33	70.00	493.33	563.33	410.00
P 338	21.70	70.67	506.67	583.33	440.00
P 338/3	20.63	80.67	460.00	516.67	336.67
P49	17.60	70.67	460.00	490.00	340.00
P57	21.60	70.67	486.67	636.67	533.33
P241	20.83	74.00	506.67	540.00	410.00
P37	23.10	70.67	486.67	526.67	400.00
P38	21.13	70.67	506.67	536.67	390.00
P47	20.80	70.67	486.67	558.33	396.67
Pant U 19	21.63	70.67	513.33	660.00	460.00
Pant U 1 0	22.27	70.67	493.33	550.00	450.00
PBG4	20.27	70.00	413.33	560.00	410.00
PHM25	21.70	72.33	386.67	453.33	373.33
PLS 364/77	19.97	80.67	523.33	696.67	463.33
PLS 364/79	22.00	72.33	460.00	606.67	390.00
PLS 364/83	20.27	70.67	486.67	480.00	326.67
PLS364/25	21.50	71.33	493.33	536.67	393.33
PLS 364/68	23.50	62.33	486.67	520.00	376.67
Vamban 1	19.57	70.67	493.33	666.67	443.33
Vamban 2	18.50	70.67	500.00	810.00	640.00
Vamban 3	21.13	70.67	506.67	550.00	353.33
Vridujjam	20.33	70.67	493.33	666.67	466.67
G.M	21.16	73.16	491.72	588.92	414.33
CD	6.53	5.98	6.90	6.55	16.26

were obtained by Sharma (1995), Sathe *et al.* (1982), Sandhu *et al.* (1991). Heritability (h^2) value was the maximum for grain yield and final better volume (98.70%) followed by raise in batter volume, initial batter volume.

The correlation coefficient were studied among six characters and are presented in Table2. The genotypic correlation coefficient was higher than the phenotypic correlation coefficient for all the characters. Regarding the association of quality characters with grain yield, apparent grain volume alone had highly significant correlation with grain yield. Regarding inter relationship between quality characters, apparent grain volume had significant negative correlation with protein content. The raise in batter volume and final batter volume had significant positive correlation with initial batter volume. This indicates that the initial batter volume may be taken as criteria for evaluating the genotype's final idli batter volume. Moreover, an increase in raise in batter volume also increased the final batter volume (Table 3). However, few genotypes showed a reduction in final batter volume after stirring compared to the initial batter volume (CO 2,

O 4). Identification of the cause for this eduction in final batter volume needs further avestigation.

References

Humphries, E.C. (1956). Mineral componenents and ash analysis. Modern methods of plant analysis, Springer-Verlag, Berlin., **1:** 468-502.

Goulden, C.H. (1952). Methods of statistical analysis, *John Wiley and Son. Inc.*, New York.

Lush, J.L. (1940). Intra sire correlation and regression of offspring on dams as a method of estimating heritability of characters. *Proc. Amer. Soc. Animal Production*, **33:** 293-301.

Robinson, H.F., R.E. Comstock and P.H. Harvey. (1949). Estimates of heritability and the degree of dominance in corn *(Zea mays). Agron. J.*, **41:** 353-359.

Santhu, T.S., R.K. Gumber and B.S. Bhullar. (1991). Correlated response of grain yield and protein content in Chickpea. *Legume Res.*, **14:** 45-47.

Sathe, S.K., S.S. Despande and D.K. Salunkhe. (1982). Functional properties of blackgram proteins. *Food Sci. Tech.*, **16:** 69-72.

Sharma, V.K. Jaidev. (1995). Genetic variability for protein and its association with seed yield trait in Vigna analysis Germplasm. *Legume Res.*, **18:** 35-40.

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