International Research Journal of Natural and Applied Sciences
Vol. 3, Issue 7, July 2016 IF- 3.827 ISSN: (2349-4077)

Website: www.aarf.asia Email : editor@aarf.asia , editoraarf@gmail.com

CHARACTER CORRELATION AND PATH COEFFICIENT IN BLACK GRAM [Vigna Mungo (L.) Hepper]

J. Sateesh Babu, Y. Pushpa Reni and M.V. Ramana

Regional Agricultural Research Station, Lam, Guntur-522034, A.P

ABSTRACT

India has distinction of being world's largest producer of pulses. The production of pulses in the country is 132.46 lakh tones from an area of 223.64 lakh hectares, with productivity of 592 kg per hectare (Anonymous, 2007). Among the pulses, black gram is important pulse crop grown in Andhra Pradesh, Madhya Pradesh, Orissa, Karnataka, Maharashtra, Tamil Nadu and Uttar Pradesh during Kharif season. As seed yield is very complex character and depends upon numerous genetic factors interacting with the environment, it is always advisable to find out the interrelationship of yield component with highly heritable characters and giving selection pressure on these characters, which accounts for the indirect selection. To accumulate optimum contribution of yield contributing characters, it is essential to know the correlation of various characters along with path coefficients. The present study was undertaken to estimate phenotypic and genotypic associations between yield contributing characters alongwith path analysis for developing suitable selection criterion for blackgram improvement.Twenty five genotypes of blackgram (Vigna mungo (L) were evaluated during rabi 2015 for the estimation of genetic variability parameters, correlation coefficient and path coefficient analysis. The genotypes differed significantly for all characters. High GCV and PCV was observed for number of pods per plant (34.54%; 35.23%) followed by seed yield (32. 52%; 34.95%), number of branches per plant (26.10%, 29.69%) and Plant height (16.88%,21.62%).High heritability coupled with high expected genetic advance was observed in number of pods per plant (96%, 89.42%) indicating

the impact of additive gene action. Number of branches per plant showed significantly positive correlation with yield both at phenotypic and genotypic level. Plant height showed significant negative correlation with yield both at phenotypic and genotypic level. Maximum direct effect of number of branches per plant on seed yield was observed.

INTRODUCTION

Blackgram [Vignamungo (L) Hepper] is a self-pollinated crop with low percentage of natural out crossing. It belongs to family fabaceae. The center of origin of blackgram is in India. Its seeds are highly nutritious with protein (24-26%), carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins. The biological value improves greatly, when wheat or rice is combined with Blackgram because of the complementary relationship of the essential amino acids such as arginine, leucine, lysine, isoleucine, valine and phenylalanine etc. India is the largest producer and consumer of blackgram in the world. Blackgram has been distributed mainly in tropical to sub-tropical countries where it is mainly grown in India, Pakistan, Sri-Lanka, Burma, and some countries of South East Asia. Its annual production is 17.60 lakh tones from 32.60 lakh hectare area in India with an average productivity of 534 kg/ha. In Madhya Pradesh, the annual production of blackgram is 2.31 lakh tones from an area of 5.92 lakh hectares. However average productivity is 390 kg/ha, which is very low, and thus its genetic yield potential in warranted (Source: - Project co-ordinates (MULLaRP) Report, IIPR, Kanpur 2011-2012). Genetic variability and their assessment for qualitative and quantitative traits of economic importance are prerequisite for any crop-improvement programme. The knowledge of correlation and path analysis is important to understand the association between the yield and its contributing character to find out guidelines for better selection of quantitative traits. Success of yield improvement largely depends upon the magnitude and nature of genetic variability present in yield contributing traits. If the variability in among germplasm the population is largely of genetic nature with least environmental influence, the probability of isolating genetically superior genotypes is high. Correlation studies also provide better understandings of yield components that help the plant breeder during selection (Robinson et al.1951 and Johnson et al.1955). The present study was carried out to understand genetic variability among 75 blackgram germ plasm collected from geographically diverse ecology of India, and to isolate superior genotypes to use in breeding programs.

MATERIALS AND METHODS

The experimental material comprised of 25 promising lines of blackgram from different enteres of india were grown in randomized block design with three replications at Research Farm, Lam, Guntur during Rabi 2015. Each plot consisted of four rows of 4m length with 10cm plant to plant and 30cm row to row distance. The observations were recorded on 5 randomly selected plants from each plot for plant height, number of branches per plant, days to 50 % flowering, pods per plant, 100-seed weight and seed yield per plant. Correlation between six quantitative characters was estimated according to the method given by Singh and Chaudhary (1977); whereas path coefficient analysis was done by method given by Dewey and Lu (1959). The statistical analysis and variance due to different sources was worked out according to Panse and Sukhatme (1967). Phenotypic and genotypic coefficients of variation were calculated based on the method advocated by Burton (1952). Heritability in broad sense and genetic advance as percent of means were estimated suggested by Jhonson et al. (1955).

RESULTS AND DISSCUSSIONS

Analysis of variance Analysis of variance was carried out for six characters in 25 genotypes and the results are presented in Table 1. The variance due to treatments (genotypes) was significant for all six characters. This gives the evidence of magnitude of genetic variability among genotypes. Genotypes were differed significantly for all the characters . The variance due to varities was significant for six traits viz.,Days to 50% flowering, Plant height, branches per plant, pods per plant, 100 seed weight and seed yield, indicating that the sufficient variability was present for above traits. The estimates of phenotypic coefficients of variation were higher than genotypic coefficients of variation which indicating that the environmental factors influencing the characters studied (Table 2). These results are in accordance with the findings of Panigrahi *et al.* (2014) and Konda *et al.* (2009). The highest PCV recorded for pods per plant (35.22) followed by seed yield (34.94), plant height (29.68) suggesting that sufficient phenotypic variability was present for these traits in the materials and the favorable effect of environment. High PCV for grain yield also reported earlier in chickpea by Yaqoob *et al*. (2010). The highest GCV recorded for pods per plant(34.54) followed by seed yield (32.52), plant height (26.10) (Table 2), indicating the presence of variation for these characters in the materials and improvement could be possible through selection of these characters. These results are in agreement with the findings of Panigrahi *et al*. (2014) for seed yield in blackgram. Heritability estimates provides the assessment of amount of transmissible genetic variability to total variability, happens to be the most important basic component that determines the genetic improvement or response to selection. In the present study, the highest heritability (broad sense) was recorded for pods per plant 96%), yield (86%),branches per plant (78%) and plant height (77%)(Table 2) indicating that the selection of these traits are likely to accumulate more additive genes leading to further improvement of their performance and these traits may be used as selection criteria in blackgram breeding program. Similar observation were reported in blackgram by Panigrahi *et al.* (2014) for branches per plant Malik *et al*. (2006) in soyabean for pods per plant, branches per plant and grain yield per plant. The high genetic advance was recorded for pods per plant (69.77) followed by seed yield (62.34), plant height (47.28), Days to 50% flowering(27.14). Hence, priority should be given to those traits which recorded higher estimates of genetic advance as percent of mean while deciding selection strategies and selection of these characters may be effective. Similar results reported in blackgram by Panigrahi *et al*. (2014). Low genetic advances were observed branches per plant (4.07)and 100 seed weight (5.37). Similar low genetic advance as percent of mean for 100 seed weight was reported in blackgram by Parameswarappa and Kumar (2005).However, heritability values coupled with genetic advance would be more reliable (Johnson *et al.,* 1955) and useful in formulating selection procedure. In the present study, heritability estimates in broad sense and genetic advance as percent of mean were estimated. High genetic advance as percent of mean coupled with high heritability was observed for pods per plant, seed yield per plant and plant height suggesting that the importance of additive gene action and selection of these characters may be effective for improvement of productivity in blackgram.

The estimates of genotypic and phenotypic correlation coefficients between different characters of black gram genotypes are presented in Table 1. In present investigation number of branches per plant showed highly significant positive correlation with seed yield per plant at both phenotypic and genotypic level. It suggested that increase in growth related traits, number of branches per plant, number of pods per plant, pod characters and seed characters might contribute to high yields in black gram. This situation meant to select high yielding genotypes of black gram, it was essential to consider the above characters with their increasing magnitude. It helped in simultaneous improvement of all the positively correlated characters. Similar results were reported by Santha and Paramasivam (1999), Venkatesan *et al.* (2004) and Chauhan (2007).

On the basis of correlation studies more emphasis is to be given on number of branches per plant contributing characters based on their strong correlation with seed yield per plant in black gram. When more number of variables were considered in correlation, the association becomes more complex and does not have the meaningful interpretation obvious. Hence, genotypic correlation partitioned in to direct and indirect effects to specify the cause and their relative importance, (Table 2). Number of branches per plant exhibited positive direct effect on seed yield per plant. This character has also been identified as major direct contributors towards seed yield in blackgram by earlier workers (Umadevi and Meenakshi 2005 and Konda 2008). Plant height showed negative direct effect on seed yield per plant. This character had positive indirect effect through days to 50% flowering, and pods per plant which resulted in negative and significant correlation with seed yield per plant. Higher positive direct effect exhibited by branches per plant with seed yield per plant but it had high negative indirect effect via days to 50 per cent flowering, number of pods per plant and 100 seed weight**.**

Conclusion : Magnitude of phenotypic coefficients of variation in selected blackgram germplasm was higher than genotypic coefficients of variation, indicating that environmental factors are influencing studied characters. High genetic advance and high heritability was recorded for pods per plant, seed yield and plant height hence selections based on the traits could improve productivity in blackgram directly.

Table :1 Analysis of variance for yield and yield attributing characters of 25 blackgram genotypes during *rabi* 2015

Source Variation	**Replication**	**Accessions**	**Error**
df	**2**	**24**	**48**
character	**Mean sum of square**		
Days to 50% flowering	0.280	2.614***	0.224
Plant height (cm)	3.64	222.513***	39.14
Branches/plant	0.026	1.3655***	0.121
Pods/plant	0.777	355.95***	4.686
100 seed weight (g)	0.003	0.074***	0.015
Yield (Kg/ha)	35670.45	257909.83***	12657.38

Table 2 : variability and genetic parameter for different character s of blackgram

	Days to 50% flowering	Plant height (cm)	Branches /plant	Pods/plant	100 seed weight (g)	Yield (kg/ha)
Range	62-35	3.3-1.2	41-38	50.13-119.3	4.3-3.8	1471-333
Mean	46.32	2.4	39.84	31.32	4.06	879.14
SE	3.61	0.20	0.27	1.24	0.07	64.95
CV%	13.5	14.1	1.18	6.9	3.02	12.79
h^2 (%)	78.0	61.0	77.0	96.0	56.0	87.0
GA(%)	5.22	34.79	60.60	89.42	6.88	79.90
PCV%	2.54	21.62	29.69	35.22	4.60	34.94
GCV%	2.24	16.88	26.10	34.54	3.46	32.52

Table 2: Estimates of phenotypic and genotypic (in parenthesis) correlation coefficients between yield and yield components in 25 blackgram (vigna mungo L.) genotypes

Character		Plant height (cm)	Branches /plant	Pods/plant	100 seed weight (g)	Yield (Kg/ha)
Days to 50% flowering	P	**-0.1617**	**0.0715**	**-0.0204**	**-0.0859**	**0.0207**
	G	(-0.1420)	(0.0458)	(-0.0267)	(-0.1257)	(-0.0007)
Plant height (cm)	P	--	**-0.2772***	**-0.2538***	**0.0369**	**-0.2451***
	G	--	(-0.2616)	(-0.3339)	(-0.0068)	(-0.3315)
Branches/plant	P	**-0.2772***	--	**0.0606**	**0.0123**	**0.7133*****
	G	(-0.2616)	--	(0.0925)	(0.0061)	(0.8535)
Pods/plant	P	**-0.2538***	**0.0606**	--	**0.2063**	**-0.0098**
	G	(-0.3339)	(0.0925)	--	(0.2860)	(-0.0263)
100 seed weight (g)	P	**0.0369**	**0.0123**	**0.2063**	--	**-0.0791**
	G	(-0.0068)	(0.0061)	(0.2860)	--	(-0.0969)

Table 3: Estimates of direct (bold) and indirect effect s of yield components in in 25 blackgram (vigna mungo L.) genotypes

Character		Days to 50% flowering	Plant height (cm)	Branches/plant	Pods/plant	100 seed weight (g)
Days to 50% flowering	P	**-0.0485**	0.0078	-0.0035	0.0010	0.0042
	G	**-0.0762**	0.0108	-0.0035	0.0020	0.0096
Plant height (cm)	P	0.0112	**-0.0695**	0.0193	0.0176	-0.0026
	G	0.0248	**-0.1745**	0.0457	0.0583	0.0012
Branches/plant	P	0.0502	-0.1945	**0.7017**	0.0425	0.0086
	G	0.0378	-0.2158	**0.8249**	0.0763	0.0050
Pods/plant	P	0.0011	0.0139	-0.0033	**-0.0548**	-0.0113
	G	0.0038	0.0475	-0.0132	**-0.1423**	-0.0407
100 seed weight (g)	P	0.0067	-0.0029	-0.0010	-0.0161	**-0.0780**
	G	0.0091	0.0005	-0.0004	-0.0206	**-0.0720**
Yield (Kg/ha)	P	0.0207	-0.2451	0.7133	-0.0098	-0.0791
	G	-0.0007	-0.3315	0.8535	-0.0263	-0.0969

REFERENCES

Anonymous. (2007). Directorate of Pulses Development (Bhopal), Annual Progress report-2007.

Burton GW (1952). Quantitative inheritance in grasses. 6th International Grassland Congress 1: 277-283.

Chauhan, M.P., Mishra, A.C. and Singh, A.K. (2007). Correlation and path analysis in urdbean. Legume Res., 30 (3): 205-208.

Dewey, D.R. and Lu, K.H. (1959). A Correlation and path coefficient analysis of component of wheat grass production. Agron J., 51 : 515-518.

Johnson HW, Robinson HF, Comstock RE (1955). Estimation of genetic and environmental variability in soybeans. Agronomy J 47: 314-318.

Konda, C.R., Salimath, P.M. and Mishra, M.N. (2008). Correlation and path coefficient analysis in black gram (Vigna mungo (L.) Hepper).

Konda CR, Salimath PM, Mishra MN (2009). Genotype and environment interaction for yield and its components in blackgram (Vigna mungo L. Hepper). Leg Res 32(3): 195-198.

Malik MFA, Qureshi AS, Ashraf M, Ghafoor A (2006). Genetic variability of the main yield related characters in soybean. Int J Agri Biol 8(6): 815.

Panigrahi KK, Mohanty A, Baisakh B (2014). Genetic divergence, variability and character association in landraces of blackgram (Vigna mungo L.) Hepper) from Odisha. J Crop and Weed 10(2): 155-165.

Panse VG, Sukhatme PV (1967). Statistical methods for agricultural workers. 2 nd Edition, ICAR New Delhi, India pp 381.

Parameswarappa SG, Kumar D. Lamani (2005). Genetic estimates, association and path coefficient analysis in blackgram. Karnataka J Agric Sci 18(1): 21-23.

Singh, R.K. and Chaudhari, B.D. (1977). Biometrical methods in quantitative genetic analysis. Kalyani Publishers, New Delhi. pp.3938.

Santha, S. and Paramasivam, K. (1999). Correlation and path analysis in rice follow black gram (Vigna mungo). Madras Agric. J., 86 (7-9): 397-400.

Umadevi. M. and Meenakshi. N.G. (2005). Correlation and path analysis for yield and yields components in black gram (Vigna mungo (L.)Hepper.) Madras Agric. J. 92 (10-12): 731-734.

Venkatesan, M., Veeramani, N., Anbuselvam, J. and Ganesan, J. (2004). Correlation and path analysis in black gram (Vigna mungo L.) Legume Res., 27 (3): 197-200.

Yaqoob M, Ahmad Bakhsh, Najeebullah Khan, Ashraf Zahid M, Lal Hussain Akhtar (2010). Studies on heritability and genetic advance in chickpea (Cicer arietinum L.). Science Technology & Development 29(3): 10-13.