International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2020; 8(1): 1244-1247
© 2020 IJCS
Received: 19-11-2019
Accepted: 21-12-2019

V Sridhar
Scientist (Plant Breeding), PJTSAU, Agricultural Research Station, Madhira, Khammam District, Telangana, India

BV Vara Prasad
Scientist (Plant Breeding), PJTSAU, Agricultural Research Station, Madhira, Khammam District, Telangana, India

D Shivani
Professor, Department of GPBR, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad, Telangana, India

S Srinivasa Rao
Scientist, ARS, Madhira, PJTSAU, Khammam District Telangana, India

Corresponding Author:
V Sridhar
Scientist (Plant Breeding), PJTSAU, Agricultural Research Station, Madhira, Khammam District, Telangana, India

Studies on genetic correlation and path coefficient analysis of blackgram (*Vigna mungo* [L.] Hepper) genotypes under rainfed situations

V Sridhar, BV Vara Prasad, D Shivani and S Srinivasa Rao

DOI: https://doi.org/10.22271/chemi.2020.v8.i1q.8422

Abstract
The experiment was conducted under rainfed condition at Agricultural Research Station, Madhira during early *rabi* 2016 using 35 blackgram germplasm lines along with four checks. Estimation of variation, phenotypic and genotypic correlations along with path analysis was calculated for the material under study. Days to maturity and plant height had positive significant correlation with number of clusters per plant, number of pods per plant, 100 seed weight, seed yield per plant and seed yield (kg/ha). Number of clusters per plant and number of pods per plant had positive significant correlation with other yield related traits. Path analysis revealed that number of pods per plant, 100 seed weight and seed yield per plant had positive direct effects coupled with positive significant correlation with seed yield (kg/ha). The above variables explain only very less percent of variability in seed yield per plant and hence some other factors which have not been considered here need to be included in this analysis to account fully for variation in seed yield per plant.

Keywords: Correlation, path analysis, blackgram genotypes

Introduction
Pulses are "nutritional powerhouse", rich in protein, high in fiber content and provide ample quantity of vitamins and minerals. Keeping in view large benefits of pulses to human health, the United Nations has proclaimed 2016 as the "International Year of Pulses". India is having the largest share of about 25% production, about 33% acreage and about 27% consuming of total pulses of the world (Arya *et al*., 2017) [1]. Black gram is a rich source of protein (20.8 to 30.5 per cent) with total carbohydrates ranging from 56.5 to 63.7 percent. It is also a good source of calcium and phosphoric acid (Asif *et al*., 2016) [2]. The major constraints in achieving higher productivity in black gram are lack of exploitable genetic variability, the absence of suitable ideotype of different cropping system and poor harvest index, susceptibility to biotic and abiotic stress, non-availability of quality seeds of improved varieties and narrow genetic base occur due to repeated usage of few parents with high degree relatedness in crossing programme. For further exploitation in breeding programs selection of suitable parents and selection of promising F_1 hybrids is important. The knowledge on interrelationship of plant characters with seed yield and among themselves is of paramount importance to the breeder for making importance in the complex character like seed yield, for which direct selection is not much effective (Mathivathana *et al*., 2015) [5]. So this research effort is undertaken to ascertain the association between seed yield and its related components among thirty five different blackgram genotypes along with four checks for evolving the superior high yielding ones.

Materials and Methods
In the present study, 35 genotypes of blackgram along with four checks were grown in randomized block design with two replications. Each replication consisting of three rows of three meters length with a spacing of 30 cm between rows and 10 cm between plants during *rabi* 2016 at Agriculture research Station, Madhira. All the recommended practices were followed to raise good crop of blackgram. Observation were recorded on five randomly selected plants from each genotype each replication for days to 50 per cent flowering, days to

maturity, plant height (cm), number of clusters per plant, number of pods per plant, 100 seed weight (g), seed yield per plant (g) and seed yield per hectare (kg/ha). The phenotypic and genotypic correlation coefficients were calculated from phenotypic and genotypic variances and co variances and path coefficients analyses were worked out as suggested by Dewey and Lu (1959) [4]. The correlation studies taken alone are often misleading and the actual dependence of seed yield on the correlated yield component characters needs confirmation, which can easily be untangled and unraveled by path coefficient analysis. The path coefficient analysis is simply a standardized partial regression coefficient and as such it measures the direct influence of one variable upon the other and permits the separation of correlation coefficients into components of direct and indirect effects. The present research was undertaken to study the correlations and path analysis in different germplasm lines of blackgram to develop a criterion for selection that could be effectively used for selecting the desirable genotypes or lines with high yield potential in future. The list of gemplasm lines used for the present study is depicted in Table 1.

Results and Discussion

Considerable amount of variability was observed in the material under study (Table 2). Days to 50% flowering showed positive significant association with days to maturity and plant height but negative significant association with 100 seed weight, seed yield per plant and seed yield (kg/ha).This showed that increased flowering duration contributed to biological yield only but not to seed yield in the present material under study. Days to maturity and plant height had positive significant correlation with number of clusters per plant, number of pods per plant, 100 seed weight, seed yield per plant and seed yield (kg/ha) (Table 3) (Fig 1). Number of clusters per plant and number of pods per plant had positive significant correlation with other yield related traits in the experimental material under study (Fig 2). Similar results for seed yield and its attributing traits were also reported by earlier workers *viz.*, Reni *et al.*, (2013) [10], Muzibul Alom *et al.*, (2014) [7], Om Vir and Singh (2014) [8], Punia *et al.*, (2014) [9], Mathivathana *et al.*, (2015) [5] and Mohanlal *et al.*, (2018) [6]. The results revealed that there is scope for simultaneous improvement of these traits through selection. Simultaneous selection of those traits showing positive significant association with seed yield should be done for yield improvement in blackgram as it is quantitative in nature.

Path coefficient analysis (Table 4) revealed that plant height exhibited negative direct effect coupled with negative indirect effects through other traits on seed yield. Number of pods per plant, 100 seed weight and seed yield per plant had positive direct effects coupled with positive significant correlation with seed yield (kg/ha) (Fig 3). Higher indirect values could most likely be neutralized by negative indirect effects through other characters and this can lead to their low and non significant correlation with seed yield per plant. These results are in agreement with the earlier findings of Om Vir and Singh (2014) [8], Punia *et al.*, (2014) [9], Mathivathana *et al.*, (2015) [5] Blessy and Pavan (2018) [3]. Thus, the present study indicated that the number of pods plant and 100 seed weight are important characters in deciding the seed yield per plant in the present material under study.

Residual effect determines how best the causal factors account for the variability of dependent factor, the grain yield per plant in this case. Its estimate being 1.0000, the variables (days to 50% flowering, days to maturity, number of clusters per plant, number of pods per plant, 100 seed weight and seed yield) explain only very less percent of variability in seed yield per plant. The reason seems to be very low and non significant correlations of these traits with seed yield per plant. Besides, some other factors which have not been considered here need to be included in this analysis to account fully for variation in seed yield per plant.

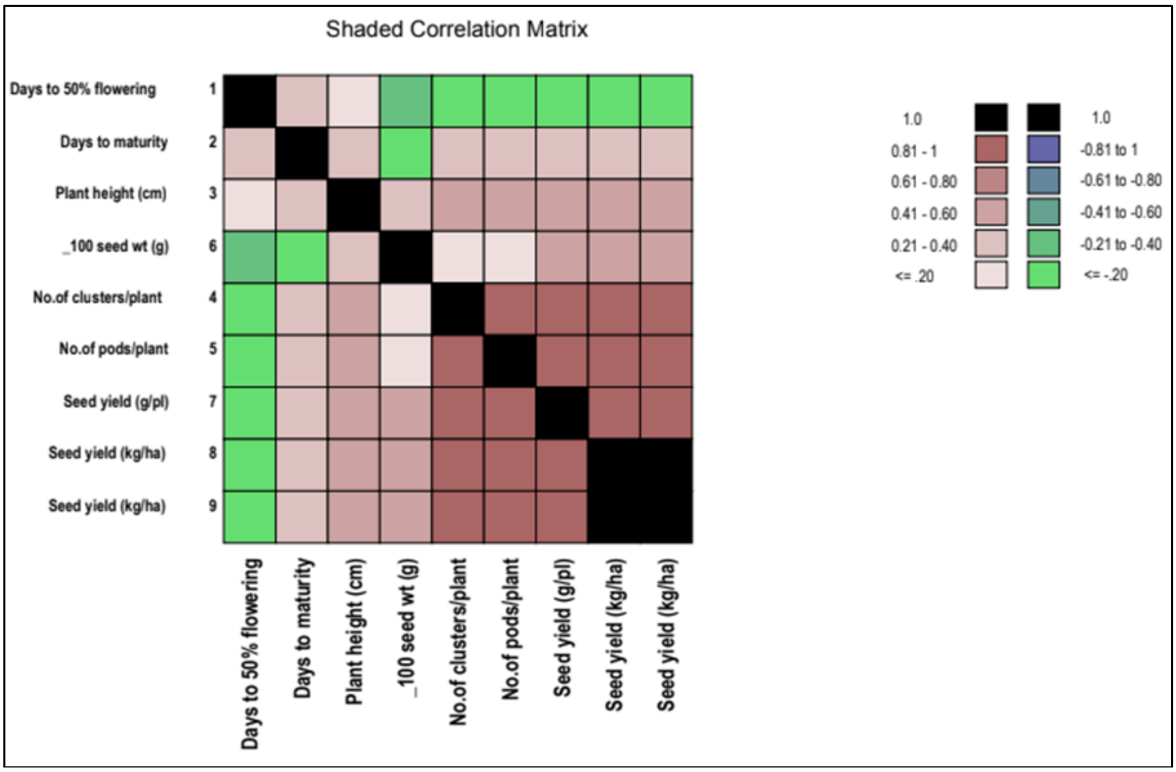

Fig 1: Shaded correlation matrix for yield components in blackgram genotypes

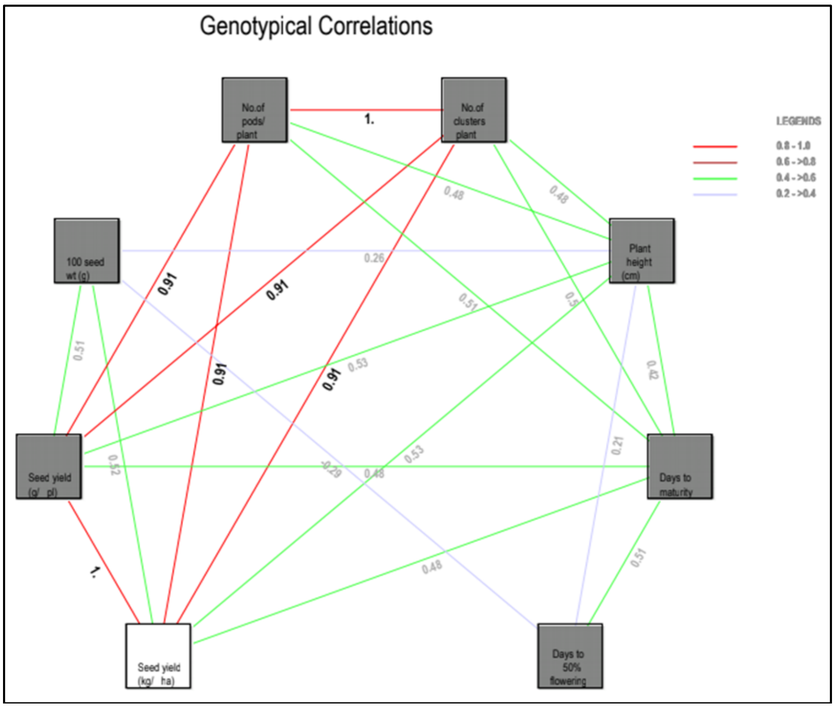

Fig 2: Genotypic correlations of yield components with seed yield (kg/ha) in blackgram genotypes

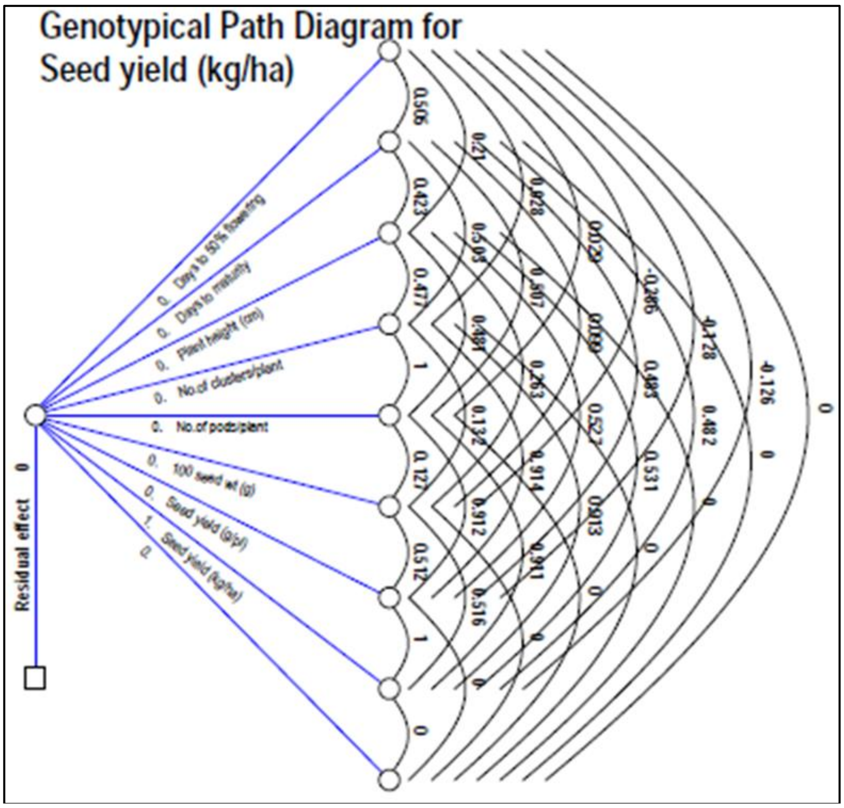

Fig 3: Genotypic path diagram of yield components with seed yield (kg/ha) in blackgram genotypes

Table 1: List of blackgram genotypes included in the study

S. No	Genotype	S. No	Genotype	S. No	Genotype	S. No	Genotype
1	IC-436560	11	IC-436635	21	IC-436774	31	IC-519742
2	IC-436565	12	IC-436638	22	IC-436780	32	IC-282008
3	IC-436604	13	IC-436652	23	IC-436789	33	IC-282009
4	IC-436606	14	IC-436656	24	IC-436792	34	IC-281993
5	IC-436609	15	IC-436667	25	IC-436811	35	IC-436910
6	IC-436610	16	IC-436720	26	IC-436852	36	MBG-207
7	IC-436612	17	IC-436753	27	IC-436869	37	LBG-752
8	IC-436621	18	IC-436758	28	IC-436882	38	PU-31
9	IC-436626	19	IC-436765	29	IC-436922	39	IPU-2-43
10	IC-436627	20	IC-436772	30	IC-523949		

Table 2: Variability estimates for eight yield components in blackgram genotypes

Character	Days to 50% flowering	Days to maturity	Plant height	Number of clusters per plant	Number of pods per plant	100 seed weight	Seed yield per plant	Seed yield (kg/ha)
GCV	4.573	3.430	24.308	26.111	26.073	11.462	29.996	29.951
PCV	5.080	5.771	26.756	30.011	30.084	13.247	34.364	34.341
h^2(broad sense)	0.810	0.353	0.825	0.757	0.751	0.749	0.762	0.761
GA (5%)	3.648	3.051	10.534	2.949	9.977	0.797	2.296	573.067
GA (1%)	4.575	3.910	13.500	3.780	12.786	1.021	2.942	734.416
GA as % of mean 5%	8.482	4.199	45.495	46.796	46.548	20.432	53.937	53.813
GA as % of mean 1%	10.870	5.382	58.304	59.975	59.654	26.185	69.123	68.964
General mean	43.013	72.654	23.154	6.303	21.433	3.900	4.256	1064.923

Table 3: Correlation coefficient estimates for yield component traits in blackgram genotypes

Character	Days to 50% flowering	Days to maturity	Plant height	Number of clusters per plant	Number of pods per plant	100 seed weight	Seed yield per plant	Seed yield (kg/ha)
Days to 50% flowering	1.0000	0.505**	0.2101*	0.0278	0.0286	-0.2863**	-0.1277*	-0.1262*
Days to maturity	0.5054	1.0000	0.4229**	0.5034**	0.5066**	0.0993	0.4833**	0.4823**
Plant height	0.2101	0.4229	1.0000	0.4768**	0.4808**	0.2632*	0.5266**	0.5314**
Number of clusters per plant	0.0278	0.5034	0.4768	1.0000	0.9984**	0.1316	0.9145**	0.9133**
Number of pods per plant	0.0286	0.5066	0.4808	0.9982	1.0000	0.1266	0.9117**	0.9106**
100 seed weight	-0.2863	0.0993	0.2632	0.1316	0.1266	1.0000	0.5119**	0.5161**
Seed yield per plant	-0.1277	0.4833	0.5268	0.9145	0.9117	0.5119	1.0000	0.9945**
Seed yield (kg/ha)	-0.1262	0.4823	0.5314	0.9133	0.9106	0.5161	0.9945	1.0000

Table 4: Path analysis estimates for yield component traits in blackgram genotypes

Character	Days to 50% flowering	Days to maturity	Plant height	Number of clusters per plant	Number of pods per plant	100 seed weight	Seed yield per plant	Seed yield (kg/ha)
Days to 50% flowering	-0.0032	-0.0016	-0.0007	-0.0001	-0.0001	0.0009	0.0004	-0.1262
Days to maturity	0.0002	0.0005	0.0002	0.0002	0.0002	0.0001	0.0002	0.4823**
Plant height	0.0015	0.0031	0.0074	0.0035	0.0035	0.0019	0.0039	0.5314**
Number of clusters per plant	-0.0015	-0.0278	-0.0263	-0.0552	-0.0552	-0.0073	-0.0505	0.9133**
Number of pods per cluster	0.0038	0.0679	0.0645	0.1342	0.1341	0.0170	0.1223	0.9106**
100 seed weight	-0.0119	0.0041	0.1009	0.0055	0.0053	0.0415	0.0213	0.5161**
Seed yield (kg/ha)	-0.1152	0.4361	0.4754	0.8252	0.8227	0.4619	0.9024	0.9945**

References

1. Arya P, Gaibriyal ML, Sapna SL. Correlation and path analysis for yield and yield components in blackgram (*Vigna mungo*). International Journal of Advanced Biological Research. 2017: 7(2):382-386.
2. Asif H, Konda CR, Nidagundi JM, Rajendragouda P. Genetic variability analysis in blackgram (*Vigna mungo* (L.) Hepper) based on quantitative traits. Green Farming. 2016; 7(3):598-601.
3. Blessy V, Pavan Naik B. Studies on Correlation and Path Analysis in Blackgram (*Vigna mungo* (L.) Hepper) Int. J Curr. Microbiol. App. Sci). 2018; 7(8):1991-1997.
4. Dewey DR, Lu KN. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy Journal. 1959; 51:515-518.
5. Mathivathana MK, Shunmugavalli N, Muthuswamy A, Vijulan HC. Correlation and path analysis in black gram. Agriculture Science Digest. 2015; 35(2):158-160.
6. Mohanlal VA, Saravanan K, Sabesan T. Studies on genetic correlation and path coefficient analysis of blackgram (*Vigna mungo* [L.] Hepper) genotypes under salinity. Journal of Phytology 2018; 10:09-11.
7. Muzibul Alom KM, Rashid MH, Biswas M. Genetic variability, correlation and path analysis in mungbean (*Vigna radiata* (L.)). J Environ. Sci. and Natural Resources. 2014; 7(1):13.
8. Om Vir, Singh AK. Genetic variability and inter characters associations studies in the germplasm of cowpea (*Vigna unguiculata* (L.) Walp) in fragile climate of western Rajasthan, (India). Legume Research. 2014; 37(2):126-132**.**
9. Punia SS, Gautam NK, Baldeva R, Preeti V, Meenakshi D, Jain NK *et al.*, Genetic variability and correlation studies in urdbean (*Vigna mingo* (L.) Hepper). Legume Research. 2014; 37(6):580-584.
10. Reni PY, Koteswara Rao Y, Satisha Y, Sateesh Babu J. Estimates of genetic parameters and path analysis in blackgram (*Vigna mungo* (L) Hepper). Int. J Pl. Ani. and Envi. Sci. 2013; 3(4):231-234.