Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(6): 2050-2052
Received: 22-08-2020
Accepted: 02-10-2020

A Kavitha Reddy
Ph.D Scholar, Department of Genetics and Plant Breeding, S.V. Agricultural College, Tirupati, Andhra Pradesh, India

M Shanthi Priya
Principal Scientist, Department of Genetics and Plant Breeding, ARS, Perumallapalli, Andhra Pradesh, India

D Mohan Reddy
Principal Scientist, Department of Genetics and Plant Breeding, RARS, Tirupati, Andhra Pradesh, India

B Ravindra Reddy
Associate Professor, Department of Statistics and Computer Applications, S.V. Agricultural College, Tirupati, Andhra Pradesh, India

Corresponding Author:
A Kavitha Reddy
Ph.D Scholar, Department of Genetics and Plant Breeding, S.V. Agricultural College, Tirupati, Andhra Pradesh, India

Correlation and path coefficient analysis for yield, yield components and water use efficiency traits in blackgram under organic fertilizer management

A Kavitha Reddy, M Shanthi Priya, D Mohan Reddy and B Ravindra Reddy

DOI: https://doi.org/10.22271/phyto.2020.v9.i6ad.13263

Abstract
Correlation and path co-efficient analysis was carried out for yield, yield component and water use efficiency traits among 30 blackgram genotypes under organic fertilizer management. Correlation studies indicated that seed yield per plant showed highly significant and positive correlation with harvest index, followed by number of primary branches per plant, number of pods per plant. It exhibited significant negative correlation with SCMR at 35 DAS and SLA at 50 DAS at both phenotypic and genotypic levels. Path Analysis revealed that harvest index exhibited high and positive direct effect on seed yield per plant followed by number of pods per plant and number of primary branches per plant. SCMR at 35 DAS and SLA at 50 DAS plant exhibited low and negative direct effects on seed yield per plant. Hence selection based on these traits would be effective in increasing the seed yield and improving water use efficiency. Opting for genotypes with low to moderate SLA readings and high SCMR at flowering stage would increase water use efficiency under organic fertilizer management.

Keywords: Correlation, path analysis, blackgram, organic fertilizer management

Introduction
Black gram (*Vigna mungo* L.) is an important short duration pulse crop grown in India. But the production of blackgram is low due to higher incidence of pests and diseases, moisture stress, poor fertilizer management etc. Therefore, to bring about any improvement in this crop, the knowledge of association of yield with other yield component and water use efficiency traits under organic fertilizer management will be of great significance.

Correlation studies indicate the magnitude of association between pairs of characters and are useful for selecting genotypes with desirable combinations of characters thereby assist the plant breeder in crop improvement. Hence, the knowledge of association of yield components with yield and among themselves and with water use efficiency traits would be of great help to the breeder in obtaining improved yields under moisture stress conditions.

As yield is a complex character controlled by many genes and greatly influenced by environment, selection based on yield is not effective, hence selection for yield components, which are less prone to environmental influences is very valuable. Therefore it is essential to measure the contribution of various traits to the yield through correlation and partitioning the correlation coefficient into the components of direct and indirect effects (Ramana and Singh, 1987) [4].

The quantity and direction of influence *i.e.* both direct and indirect effects are estimated by path coefficient analysis. It also reveals whether the association of these characters with yield is due to their direct effect on yield or it is a consequence of their indirect effect via some other character.

Material and Methods
The present investigation was carried out among 30 blackgram genotypes during *Kharif,* 2017 at dry land farm of Sri Venkateswara Agricultural College, Tirupati using a Randomized Block Design with three replications.

FYM was applied @ of 20 t ha^{-1} at the time of field preparation and *Jeevamrutha* @ 500 L ha^{-1}(Ruchi, and Akshay, 2017) [5] was appliedat 15 days interval20 days after sowing (DAS). Seed treatment was done with 3% *panchagavya* (Ram, 2017) [3] and it was again sprayed 25 and 35 DAS. For control of sucking pests, *bramhasthram* @ 2.5 % (Ruchi, and Akshay, 2017) [5] as sprayed. No inorganic chemicals were used. Cultural practices like weeding and irrigation were followed to maintain good crop growth.

Observations were recorded on five randomly selected plants in each genotype for plant height, number of primary branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length, number of seeds per pod, 100 seed weight, harvest index, SPAD chlorophyll meter reading at 35 DAS, SPAD chlorophyll meter reading at 50 DAS, Specific leaf area 35 DAS, Specific leaf area 50 DAS, relative water content and seed yield per plant, whereas for days to 50 % flowering and days to maturity observations were recorded on plot basis.

Genotypic and phenotypic correlation coefficients were calculated using the method given by Johnson *et al.* (1955) [2]. Path coefficient analysis suggested by Wright (1921) [6] and elaborated by Dewey and Lu (1959) [1] was used to calculate the direct and indirect contribution of various traits to yield

Results and Discussion

The traits *viz.*, number of primary branches per plant, number of pods per plant, harvest index exhibited significant positive correlation, where as SCMR at 35 DAS and SLA at 50 DAS recorded significant negative association with seed yield per plant. The results indicated that selection for the genotypes with more number of primary branches per plant, more number of pods per plant leads to increased seed yield per plant and opting for genotypes with low SLA readings and high SCMR at flowering stage would increase water use efficiency under organic fertilizer management. (Table 1).

Path coefficient analysis was conducted using seed yield per plant as dependent variable and five independent variables, number of primary branches per plant, number of pods per plant, harvest index, SCMR at 35 DAS and SLA at 50 DAS that exhibited significant phenotypic correlation with seed yield per plant. The results are presented in Table 2 and path diagram is furnished in Fig. 1.

Among these traits, harvest index exhibited high and positive direct effect on seed yield per plant (0.3716) followed by number of pods per plant (0.1483) and number of primary branches per plant (0.1144). SCMR at 35 DAS (-0.1627) and SLA at 50 DAS plant (-0.1176) exhibited low and negative direct effects on seed yield per plant.

Under organic fertilizer management, estimates of residual effect was considerably high (0.837) signifying the need for inclusion of some more traits that have been left behind in the present study.

Positive direct effect and significant positive association of harvest index with seed yield per plant indicates its importance in improving seed yield. Moreover, significant positive association of other traits *viz.*, number of primary branches per plant, number of pods per plant, pod length with seed yield per plant was due to their positive indirect effects through harvest index. Therefore, harvest index should be given more importance during selection process under organic fertilizer management.

Among water use efficiency traits, SCMR at 35 DAS and SLA at 50 DAS must be considered as selection criteria. The genotypes with higher SCMR at 35 DAS and low SLA at 50 DAS values were considered to be more water use efficient.

Conclusion

Selection for the genotypes with more number of primary branches per plant, number of pods per plant and high harvest index may result in increased seed yield per plant and opting for genotypes with moderate SLA and high SCMR at flowering stage would increase water use efficiency under organic fertilizer management. These genotypes could be further utilised as parents in breeding programs.

Table 1: Phenotypic (r_p) and genotypic (r_g) correlation coefficients among yield, yield components and water use efficiency traits in blackgram under organic fertilizer management

		DF	DM	PH (cm)	PB	CP	PC	PP	PL (cm)	SP	100 SW (g)	HI (%)	SCMR 35	SCMR 50	SLA 35	SLA 50	RWC (%)	SYP (g)
DF	r_p	1	0.220*	0.176	-0.024	0.030	0.024	-0.052	0.032	-0.222*	0.026	-0.355**	0.187	0.206	-0.217*	-0.040	-0.105	-0.057
	r_g	1	0.540**	0.369**	-0.016	-0.065	0.243*	-0.032	0.088	-0.386**	0.039	-0.534**	0.373**	0.355**	-0.428**	-0.090	-0.149	-0.010
DM	r_p		1	0.138	-0.015	0.043	-0.124	0.021	0.115	-0.098	-0.072	-0.218*	0.084	-0.064	-0.054	0.079	-0.068	-0.173
	r_g		1	0.237*	0.128	0.141	-0.316**	0.036	0.257*	0.067	-0.270*	-0.133	0.004	-0.419**	-0.198	0.075	-0.326**	-0.404**
PH (cm)	r_p			1	0.098	0.237*	0.112	0.243*	-0.220*	-0.350**	0.165	-0.357**	-0.018	-0.031	-0.085	0.192	-0.085	0.104
	r_g			1	0.158	0.285**	0.150	0.297**	-0.277**	-0.456**	0.194	-0.523**	-0.090	-0.016	-0.149	0.243*	-0.073	0.146
PB	r_p				1	0.398**	0.273**	0.373**	-0.201	0.153	0.154	0.064	-0.371**	-0.091	0.304**	0.077	0.135	0.245*
	r_g				1	0.519**	0.682**	0.499**	-0.290**	0.334**	0.217*	0.059	-0.434**	-0.144	0.480**	0.138	0.233*	0.434**
CP	r_p					1	0.249*	0.856**	-0.477**	-0.039	0.115	0.012	-0.199	0.138	0.132	-0.055	0.009	0.147
	r_g					1	0.518**	0.945**	-0.539**	-0.029	0.122	0.027	-0.235*	0.220*	0.116	-0.028	0.016	0.168
PC	r_p						1	0.459**	-0.122	-0.085	0.395**	-0.084	-0.069	0.006	0.014	0.069	-0.088	0.074
	r_g						1	0.834**	-0.294**	-0.515**	0.953**	-0.245*	-0.171	-0.114	-0.082	0.272**	0.043	0.357**
PP	r_p							1	-0.407**	-0.120	0.252*	0.025	-0.169	0.078	0.056	-0.014	-0.036	0.230*
	r_g							1	-0.476**	-0.113	0.292**	0.043	-0.226*	0.107	0.065	-0.005	-0.053	0.261*
PL (cm)	r_p								1	0.070	-0.052	0.017	0.027	-0.092	0.105	-0.076	-0.375**	-0.036
	r_g								1	0.029	-0.056	-0.036	0.075	-0.136	0.157	-0.033	-0.487**	-0.091
SP	r_p									1	-0.221*	0.281**	-0.073	-0.022	0.268*	0.190	0.191	0.094
	r_g									1	-0.350**	0.441**	-0.071	-0.094	0.412**	0.305**	0.385**	0.134

Table 1: Cont…

		DF	DM	PH (cm)	PB	CP	PC	PP	PL (cm)	SP	100 SW (g)	HI (%)	SCMR 35	SCMR 50	SLA 35	SLA 50	RWC (%)	SYP (g)
100SW(g)	r_p										1	-0.210*	0.075	-0.065	-0.230*	-0.049	-0.055	-0.004
	r_g										1	-0.292**	0.085	-0.080	-0.270*	-0.066	-0.071	-0.038
HI (%)	r_p											1	-0.172	-0.042	0.124	-0.287**	0.070	0.445**
	r_g											1	-0.223*	-0.058	0.228*	-0.372**	0.110	0.542**
SCMRat35 DAS	r_p												1	0.264*	-0.526**	-0.043	-0.015	-0.289**
	r_g												1	0.420**	-0.743**	-0.116	0.031	-0.327**

SCMRat50 DAS	r_p													1	-0.114	0.034	-0.074	0.017
	r_g													1	-0.139	0.019	-0.220*	-0.061
SLAat35DAS (cm^2g^{-1})	r_p														1	0.154	0.108	0.113
	r_g														1	0.248*	0.194	0.142
SLAat50DAS (cm^2g^{-1})	r_p															1	-0.108	-0.210*
	r_g															1	-0.189	-0.256*
RWC (%)	r_p																1	-0.041
	r_g																1	-0.184
SYP(g)	r_p																	1
	r_g																	1

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

DF: Days to 50% flowering; DM: Days to maturity; PH: Plant height (cm) ;PB: Primary branches per plant; CP: Clusters per plant; PC: Pods per cluster; PP: Pods per plant: PL: Pod length (cm); SP: Seeds per pod; 100 SW: 100 seed weight (g); HI: Harvest index (%); SCMR 35: SPAD chlorophyll meter reading at 35 DAS: SCMR 50: SPAD chlorophyll meter reading at 50 DAS ;SLA 35: Specific leaf area at 35 DAS ;SLA 50: Specific leaf area at 50 DAS; RWC: Relative water content (%); SYP: Seed yield per plant(g).

Table 2: Phenotypic path coefficient analysis for yield, yield components and water use efficiency traits in blackgram under organic fertilizer management

	No. of primary branches per plant	No. of pods per plant	Harvest index (%)	SPAD chlorophyll reading at 35 DAS	Specific leaf area at 50 DAS (cm^2g^{-1})	Seed yield per plant (g)
No. of primary branches per plant	0.1144	0.0554	0.0239	0.0604	-0.009	0.245*
No. of pods per plant	0.0427	0.1483	0.0095	0.0274	0.0016	0.230*
Harvest index (%)	0.0074	0.0038	0.3716	0.0281	0.0337	0.445**
SPAD chlorophyll reading at 35 DAS	-0.0424	-0.0250	-0.0641	-0.1627	0.0051	-0.289**
Specific leaf area at 50 DAS(cm^2g^{-1})	0.0088	-0.002	-0.1065	0.0070	-0.1176	-0.210*

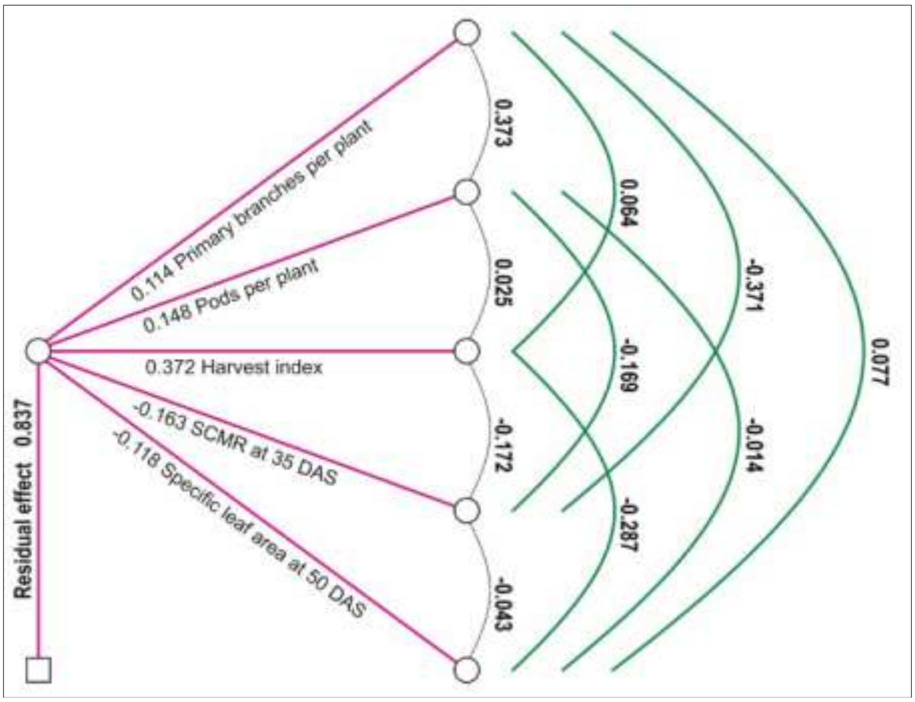

Fig 1: Phenotypic path diagram for yield, yield components and water use efficiency traits under organic fertilizer management

References

1. Dewey JR, Lu KH. Correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy Journal 1951;51:515-518.
2. Johnson HW, Robison HF, Comstock RE. Genotypic and phenotypic correlations in soybean and their implications in selection. Agronomy Journal 1955;47:477-83.
3. Ram M. Panchagavya is a bio-fertilizer in organic farming. Journal of Advanced Science and Research 2017;2:54-57.
4. Ramana MV, Singh DP. Genetic parameters and character association in greengram. Indian Journal of Agriculture Science 1987;57:661-663.
5. Ruchi B, Akshaya B. An Overview: Zero Budget Natural Farming. Trends in Biosciences 2017;10:9314-9316.
6. Wright S. Correlation and Causation. Journal of Agricultural Research 1921;20:557-585.