RESEARCH PAPER

Correlation and path coefficient analysis in greengram [*Vigna radiata* (L.) Wilczek]

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The correlation coefficients among twelve yield contributing traits with their path effects towards and seed yield using fifty-eight genotypes of greengram were investigated in during *Kharif* 2010. The analysis of correlation coefficient suggested that the magnitude of genotypic correlations were higher than the corresponding phenotypic correlations. The seed yield per plant had highly significant and positive correlations both at genotypic and phenotypic levels with number of pods per plant, number of pods per cluster, number of clusters per plant and number of seeds per pod. Seed yield per plant showed negative and highly significant correlation with days to maturity at both the levels and days to 50 per cent flowering at only genotypic level. The path coefficient analysis revealed that maximum direct effects as well as appreciable indirect influences were exerted by number of pods per plant, number of clusters per plant and number of pods per cluster towards seed yield per plant. Based on correlation and path analysis, number of pods per plant, number of clusters per plant, number of pods per cluster, number of seeds per pod and days to maturity were identified as the most important components of seed yield. It was apparent from the path analysis that maximum direct effects as well as appreciable indirect influences were exerted by number of pods per plant, number of clusters per plant and number of pods per cluster towards seed yield per plant. This suggested that emphasis should be given to these traits in selection programme for improvement of seed yield in greengram

Key words **:** Correlation, Greegram, Path analysis

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INTRODUCTION

Greengram [*Vigna radiata* (L.) Wilczek] is the important pulse crop of the India which is cultivated from humid tropic to arid regions. The productivity of greengram is also low as in the case of other pulse crops. Yield is a complex and poly genetically controlled highly environmental influenced trait governed by the interaction of many variables and selection if based merely on yield is not effective. The efficiency of selection will increase, if the nature and magnitude of inter-relationship among component characters and seed yield is understood. Correlation analysis is a biometrical technique to find out the nature and degree of association between various physico-chemical traits indicating yield, while path analysis splits the correlation coefficient into direct and indirect effect so as to measure the relative contribution of each variable towards yield. Hence, keeping the above aspects in mind, efforts were made to establish interrelationship among various yield contributing traits and also their contribution towards pod yield of greengram. This will be facilitating the breeder to design appropriate selection strategies to increase seed yield in greengram.

RESEARCH METHODOLOGY

Fifty-eight diverse genotypes of greengram were sown in a randomized block design with three replications at the Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh, during *Kharif* 2010 under rained conditions. Each genotype was accommodated in a single row of 3.0 m length with a spacing of 45 cm between rows and 10 cm between plants within the row. The genotypes were randomly allotted to the plot in each replication. The experiment was surrounded by guard rows to avoid damage and border effects. All the recommended packages of practices

were followed for raising healthy crop. Data were recorded on randomly selected five plants from each genotype per replication and average value was used for the statistical analysis for twelve characters *viz*., days to 50 per cent flowering, days to maturity, 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- seeds weight, seed yield per plant and protein content. The phenotypic and genotypic correlation coefficients for all the characters were worked out through covariance analysis as per Al-Jibouri *et al.* (1958). The phenotypic as well as genotypic path coefficient analysis was done as per the method suggested by Dewey and Lu (1959).

RESEARCH FINDINGS AND ANALYSIS

The findings of the study have been discussed in detail as under:

Correlation coefficients:

Genotypic and phenotypic correlation coefficients are presented in Table 1. The associations at phenotypic levels are generally considered, as there is no tangible test for knowing the statistical significance of correlation at genotypic level (Reddy and Sharma, 1982; Singh *et al.*, 1998; Dhayal *et al.*, 2003). In general, the magnitudes of genotypic coefficient of correlations (r_g) were higher than their corresponding phenotypic coefficient of correlations (r_p) in the present investigation. This indicated that though there was high degree of association between two variables at genotypic level, its phenotypic expression was deflated by the influence of environment. It has also indicated that there was an inherent relationship between the characters studied which is in agreement with the conclusions of Kumar *et al.* (1995), Vikas *et al.* (1999) and Haritha and Reddy (2002). The phenotypic correlation coefficient of number of branches per plant with pod length and number of clusters per plant with number of pods per cluster were higher than the genotypic correlation which might be due to the non genetic causes probably environment inflated the value of phenotypic correlation.

The study of genotypic correlation gives an idea of the extent of relationship between different variables. This relationship among yield contributing characters as well as their association with yield provides information for exercising selection pressure for bringing genetic improvement in seed yield. In the present study, seed yield per plant was found to

Table 1 : Genotypes (r_g) and phenotypic (r_p) correlation coefficients among twelve characters in greengram

Characters		Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches per plant	No. of cluster per plant	No. of pods per cluster	No. of pods per plant	Pod length (cm)	No. of seeds per pod	100 seed weight (g)	Protein content (%)
Seed yield per plant	r_g	-0.350**	-0.326**	0.015	0.043	0.662**	0.795**	0.994**	-0.240	0.312**	0.043	0.078
(g)	r_p	-0.141	-0.154*	0.081	0.065	0.547**	0.640**	0.972**	-0.114	0.202**	0.059	0.083
Days to 50%	r_g		1.000**	0.340**	0.454**	0.035	-0.454**	-0.324**	0.179*	0.068	0.130	-0.179*
flowering	r_p		0.955**	0.221**	0.300**	-0.016	-0.133	-0.134	0.099	0.017	0.104	-0.035
Days to maturity	r_g			0.327**	0.446**	0.026	-0.408**	-0.299**	0.215**	0.070	0.126	-0.172*
	r_p			0.234**	0.306**	0.000	-0.170*	-0.151*	0.078	0.010	0.107	-0.041
Plant height (cm)	r_g				0.654**	0.153*	-0.066	0.048	0.580**	0.147	0.310**	0.027
	r_p				0.399**	0.088	0.013	0.081	0.274**	0.104	0.181*	0.044
No. of branches per	r_g					-0.126	0.230**	0.074	0.118	0.372**	0.308**	0.188*
plant	r_p					-0.057	0.141	0.087	0.180*	0.175*	0.235**	0.168*
No. of cluster per	r_g						0.119	0.669**	-0.302**	0.081	-0.070	0.005
plant	r_p						-0.210**	0.522**	-0.149*	0.079	-0.053	-0.008
No. of pods per	r_g							0.807**	-0.139	0.277**	0.167*	0.228**
cluster	r_p							0.703**	-0.032	0.159*	0.144	0.182*
No. of pods per plant	r_g								-0.239**	0.282**	0.066	0.131
	r_p								-0.101	0.209**	0.083	0.130
Pod length (cm)	r_g									0.453**	0.091	-0.053
	r_p									0.028	0.060	0.044
No. of seeds per pod	r_g										0.080	0.070
	r_p										0.059	0.038
100-seed weight (g)	r_g											0.684**
	r_p											0.627**

* and ** indicate significance of values at P=0.05 and 0.01, respectively

be significantly and positively correlated with number of pods per plant, number of pods per cluster, number of clusters per plant and number of seeds per pod at both the genotypic and phenotypic levels. Such positive interrelationship between seed yield and these attributes has also been reported in greengram by several researchers. The positive genotypic association has been reported between seed yield per plant recorded by Vikas *et al.* (1999), Rajan *et al.* (2000), Venkateswarlu (2001), Haritha and Reddy (2002), Nazir *et al.* (2005) and Singh *et al.* (2009). They can serve as market/ indicator characters for improvement in seed yield.

Days to maturity showed negative and highly significant correlation with seed yield per plant at both the levels and days to 50 per cent flowering at only genotypic level. Similar results were obtained by Prakash *et al.* (2007) and Verma and Garg (2007). But contrary to this, Kumar *et al*. (2005) noticed positive significant relationship with days to 50 per cent flowering.

Days to flowering had positive and significant association with days to maturity at both levels is of an important component in identifying and deciding the duration of the crop. This, it indicated that flowering time was an important indicator of maturity. Both these traits *i.e.* days to flowering and days to maturity were also found to have positive and significant correlations with number of branches per plant and negative associations with number of pods per cluster and number of pods per plant at genotypic levels only. These results are in line with the earlier findings of Sirohi *et al.* (2007). In contrast, Haritha and Reddy (2002) reported significant and positive correlation of days to flowering with number of clusters per plant and number of pods per plant.

The relationship of plant height with number of branches

Table 2 : Genotypes path coefficient analysis showing direct (diagonal) and indirect (non-diagonal) effects of twelve characters on seed yield in greengram

Characters	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches per plant	No. of cluster per plant	No. of pods per cluster	No. of pods per plant	Pod length (cm)	No. of seeds per pod	100 seed weight (g)	Protein content (%)	Genotypic correlation with seed yield
Days to 50% flowering	**0.008**	0.008	0.003	0.004	0.000	-0.004	-0.003	0.001	0.001	0.001	-0.001	-0.350**
Days to maturity	-0.053	**-0.050**	-0.016	-0.022	-0.001	0.020	0.015	-0.011	-0.004	-0.006	0.009	-0.326**
Plant height (cm)	0.004	0.003	**0.010**	0.007	0.002	-0.001	0.001	0.006	0.002	0.003	0.000	0.015
No. of branches per plant	-0.014	-0.014	-0.020	**-0.031**	0.004	-0.007	-0.002	-0.004	-0.011	-0.009	-0.006	0.043
No. of cluster per plant	-0.005	-0.004	-0.023	0.019	**-0.149**	-0.018	-0.099	0.045	-0.012	0.011	-0.001	0.662**
No. of pods per cluster	0.088	0.079	0.013	-0.045	-0.023	**-0.193**	-0.156	0.027	-0.054	-0.032	-0.044	0.795**
No. of pods per plant	-0.392	-0.361	0.058	0.089	0.810	0.977	**1.210**	-0.289	0.341	0.080	0.159	0.994**
Pod length (cm)	-0.011	-0.013	-0.034	-0.007	0.018	0.008	0.014	**-0.059**	-0.027	-0.005	0.003	-0.240**
No. of seeds per pod	0.005	0.005	0.011	0.029	0.006	0.021	0.022	0.035	**0.077**	0.006	0.005	0.312**
100-seed weight (g)	0.007	0.006	0.016	0.016	-0.004	0.009	0.003	0.005	0.004	**0.051**	0.035	0.043
Protein content (%)	0.014	0.014	-0.002	-0.015	0.000	-0.018	-0.011	0.004	-0.006	-0.055	**-0.080**	0.078

Residual effect, R=0.0581

N.B. : Values at diagonal (bold letters) indicate direct effects of respective characters

* and ** indicate significance of values at P=0.05 and 0.01, respectively

per plant, pod length and 100-seed weight were positive and highly significant at both levels. Similar results were recorded Muhammod *et al.* (2009) only for number of branches per plant.

Number of branches per plant exhibited positive and highly significant associations with 100-seed weight followed by number of seeds per pod and protein content at both genotyic as well as phenotypic levels. Number of branches per plant was significantly and positively associated with protein content, which was confirmed by Naik *et al.* (2000). Number of pods per cluster correlated with number of branches per plant at genotypic level only.

The significant and positive association was observed between number of pods per cluster and number of pods per plant. Haritha and Reddy (2002) also reported positive and significant association of number of pods per cluster and number of pods per plant.

The correlations of pod length with number of seeds per pod and 100-seed weight were positive and significant at genotypic level only. These results are in conformity with the findings of Vikas *et al.* (1999) and Haritha and Reddy (2002).

The results thus, revealed that number of seeds of pods per plant, number of pods per cluster, number of clusters per plant, number of seeds per pod and days to maturity were the important attributes which contributed towards higher yield. Therefore, more emphasis should be given to these components during selection for higher yield and hence, selection on the basis of these characters might result in improvement of the greengram. The interrelationship among yield components would help in increasing the yield levels of greengram.

Path coefficient analysis :

Seed yield, a polygenic trait, is influenced by its various components directly as well as indirectly via other traits, which create a complex situation before a breeder for making selection. Therefore, path coefficient analysis could provide a more realistic picture of the interrelationship, as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficient. In the present study, all the 12 characters were considered as causal variables of seed yield and genotypes correlation coefficients of these characters with seed yield were partitioned into the direct and indirect effects through path coefficient analysis (Table 2).

The path coefficient analysis revealed that the highest direct and positive effect on yield was exhibited by number of pods per plant followed by number of seeds per pod and 100-seed weight. Number of cluster per plant and number of pods per cluster had high but negative direct effect on seed yield. Thus, these characters turned out to be the major components of seed yield. Such positive and high direct effects of these variables have also been reported by Byregowda *et al.* (1997), Venkateswarlu (2001), Nazir *et al.* (2005) and Peerajade *et al.* (2009). Number of cluster per plant and number of pods per cluster had negative and high direct effect but supplemented through positive and high indirect effect via number of pods per plant. Similar results were obtained by Haritha and Reddy (2002) and Peerajade *et al.* (2009).

The residual effect on seed yield per plant was low (0.0581). It indicated that characters under study were enough to know the effect of seed yield.

It was apparent from the path analysis that maximum direct effects as well as appreciable indirect influences were exerted by number of pods per plant, number of clusters per plant and number of pods per cluster towards seed yield per plant. These characters also exhibited significant and positive association with seed yield per plant and hence, they may be considered as the most important yield contributing characters and due emphasis should be placed on these components while breeding for high yielding types in greengram.

LITERATURE CITED

Al-Jibouri, H.A., Miller, P.A. and Robinson, H.F. (1958). Genotypic and environmental variances in upland cotton cross of interspecific origin. *Agron J.*, **50** : 633-635.

Byregowda, M., Chandraprakash, J., Babu, C.S.J. and Rudraswamy, P. (1997). Genetic variability and interrelationship among yield and yield components in greengram. *Crop Res.*, **13** : 361-368.

Dewey, D.R. and Lu, K.H. (1959). Correlation and path analysis of component of created wheat grass seed production. *Agron J.*, **51** : 513-518.

Dhayal, L.S., Sastry, E.V.D. and Jakar, M.K. (2003). Correlation association in wheat grown under normal and saline conditions. *Crop Impov.,* **30** : 95-98.

Haritha, S. and Reddy, S.M. (2002). Correlation and path coefficient analysis in mungbean. *Legume Res.*, **25** : 180-183.

Kumar, S.S., Sudharshanam, A., Vinod Kumar, S. and Narismha Reddy, V. (1995). Correlation and path-coefficient analysis in greengram. *Madras Agric. J.*, **82** : 160-161.

Muhammad, Arshad, Aslam, Muhammad and Irshad, Muhammad (2009). Genetic variability and character association among morphological traits of mungbean [*Vigna radiata* (L.). Wilczek] genotypes. *J. Agric. Res. Lahore*, **47** (2) : 121-126.

Naik, B.S., Pattanayak, S.K. and Kole, C. (2000). Selection of protein rich genotypes in mungbean. *Indian J. Genet.*, **60** : 321-326.

Nazir, Asifa, Sadiq, M.S., Hanif, M., Abbas, G. and Haidar, S. (2005). Genetic parameters and path analysis in mungbean, [*Vigna radiata* (L.) Wilczek]. *J. Agric. Res. Lahore*, **43** (4) : 339-347.

Prakash, Ved, Singh, R.V. and Khedar, O.P. (2007). Genetic parameters, correlation and path analysis among yield and yield characters in mungbean. *J. Arid Legumes*, **4** (1) : 6-8.

Peerajade, D., Ravikumar, R.L. and Salimath, P.M. (2009). Genetic variability and character association in local green [*Vigna radiata* (L.) Wilczek] genotypes of Karnataka. *Environ. Eco.,* **27** (1) : 165-169.

Rajan, R.E.B., Wilson, D. and Kumar, Vijayaraghav (2000). Correlation and path analysis in the F_2 generation of greengram. *Madras Agric. J.,* **87** : 590-593.

Reddy, N.S. and Sharma, R.K. (1982). Variability and interrelationship for yield and protein content in inbred lines of bajara. *Crop Improv.*, **9** : 124-128.

Singh, R.P., Garg, D.K. and Sharma, P.C. (1998). Character association in wheat. *Indian J. Genet.*, **58** : 219-221.

Singh, Tejbir, Sharma, Amitesh and Alie, F.A. (2009). Morpho-physiological traits as selection criteria for yield improvement in mungbean [*Vigna radiata* (L.) Wilczek]. *Legume Res.*, **32** (1) : 36-40.

Sirohi, S.P.S., Dhama, S.K., Singh, S.P., Nitin Kumar and Bahuguna, O.K. (2007). Correlation and path coefficient analysis in mungbean [*Vigna radiata* (L.) Wilczek]. *Prog. Res.,* **2** (1/2) : 129-131.

Venkateswarlu, O. (2001). Genetic variability in greengram. *Legume Res.*, **24** : 69-70.

Verma, P. and Garg, D.K. (2007). Correlation and path coefficient studies in mungbean [*Vigna radiata* (L.) Wilczek]. *J. Arid Legumes*, **4** (2) : 88-91.

Vikas, Paroda, R.S. and Singh, S.P. (1999). Phenotypic correlation and direct and indirect relation of component characters with seed yield in mungbean over environment. *Ann. Agric. Res.*, **20** : 411-417.

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