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Research Note

Association analysis for seed yield and component traits in interspecific derivatives of greengram and blackgram

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Abstract
A total of 52 progenies in F_5 generation derived from an interspecific cross between greengram (*Vigna radiata* cv. VBN(Gg)2) and blackgram (*Vigna mungo* cv. Mash 114) were subjected to correlation and path analysis. Based on the results of the present study, it can be concluded that number of pods per plant recorded significant and positive association with seed yield per plant. This trait alone recorded high direct effect on seed yield per plant. It also had moderate to high indirect effect for other traits. Hence number of pods per plant can be given top most priority while framing selection strategy for improvement of seed yield in interspecific derivatives of *Vigna radiata* x *Vigna mungo*.

Key words
Greengram, blackgram, interspecific cross, association, seed yield

Pulses are considered as an excellent source of dietary protein for human beings. It plays a key role in crop rotation due to their ability to fix atmospheric nitrogen. Among the pulses, chickpea, pigeonpea, blackgram and greengram are the major contributors of the total pulses production. Greengram (*Vigna radiata* (L.) Wilczek) is an important pulse crop in developing countries of Asia, Africa and Latin America, where it is consumed as dry seeds and fresh green pods (Karuppanapandian *et al*., 2006). It is one of the important edible food legumes of Asia and widely cultivated and consumed throughout India. It is cultivated in tropical, sub-tropical and temperate zones of Asia including Bangladesh, India, Pakistan, Myanmar, Indonesia, Philippines, Srilanka, Nepal, China, Korea, and Japan (Shanmugasundaram, 2001). India is the leading greengram cultivator with 55% of the total world acreage and 45% of total production (Rishi, 2009; Singh *et al*., 2013). In India, the greengram is being cultivated in an area of 3.83 million hectare with an annual production and productivity of 1.60 million tones and 418 kg/ha respectively. In Tamil Nadu, next to blackgram, the greengram is cultivated in an area on 2.5 lakhs hectare with a production of 1.34 lakh tones and productivity of 536 kg/ha (Anonymous, 2017). In the current situation of population explosion, there is an urgent need to enhance the genetic potential of greengram for seed yield. Interspecific hybridization is one of the methods to create genetic variability and widening the genetic base of a crop species. Continuous breeding efforts for improvement of greengram had exhausted the available variability in these crops. Both of these species have some desirable characters like, early maturity, erect growth habit and long pods with more seeds per pod in greengram. likewise, blackgram possess non-shattering pods with synchronous maturity, more clusters/plant, pods with large seeds and comparatively more durable resistance to yellow mosaic virus. So It becomes essential to to develop viable hybrids by interspecific crosses. These hybrids need to be critically evaluated in the segregating generations for improvement in seed yield and yield components (Pandiyan *et al*., 2010).

It is essential to understand the genetic architecture and nature of gene action governing seed yield and its component traits. Yield is the resultant product of various morphological and biological components. Identification of important yield components and information about the nature and magnitude of their direct and indirect contributions towards the seed yield trait is very essential for devising successful crop breeding strategy in any crop. The correlation and path-coefficient analysis provide information about the relative importance of various yield components in the expression of yield which in turn, helps in formation of appropriate selection strategy.

Therefore, in the present investigation correlation and path coefficient studies in interspecific derivatives of greengram were carried out.

A total of 52 F_5 progenies from the interspecific cross between greengram (VBN(Gg)2) and blackgram (Mash 114) formed the basic genetic material for the present investigation. The experiment was conducted at National Pulses Research center (NPRC), Tamil Nadu Agricultural University, Vamban during *rabi* 2017-18. All the 52 progenies were evaluated in two rows each with a row length of 4m. Plant to plant spacing of 10 cm and row to row spacing of 30 cm was adopted. Recommended package of practices were followed. Nine quantitative traits *viz.* plant height (cm), number of branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length (cm), number of seeds per pod, 100- seed weight (g) and seed yield per plant (g) were recorded on 1023 individual plant basis. Simple correlation between seed yield as well as its component traits and among themselves was worked out as per the method suggested by Johnson *et al.* (1955). Path coefficient analysis was carried out as suggested by Dewey and Lu (1959). Data were subjected to statistical analysis *viz.* correlation and path analysis as per standard procedures using TNAUSTAT statistical package (Manivannan, 2014).

Simple correlations coefficients between seed yield per plant and its component characters as well as inter relationship among the different traits are presented in Table 1. Seed yield per plant expressed significant and positive association with all the traits studied. This result was in accordance with the findings of Haritha and Sekhar (2002), Rao *et al.* (2006) and Vijaylaxmi and Bhattacharya (2006).

Knowledge on association of component characters with yield has great importance to plant breeders, as it helps in their selection with more precision and accuracy. The degree of relationship and association of these components with yield can be measured by correlation coefficients.

In the present investigation, number of branches per plant had significant and positive correlation with number of clusters per plant, number of pods per cluster, number of pods per plant, pod length, number of seeds per pod and 100- seed weight. This was supported by the resuls of Rao *et al.* (2006). Number of clusters per plant expressed significant and positive relationship with number of pods per cluster, number of pods per plant, pod length, number of seeds per pod and 100- seed weight. Number of pods per cluster had significant positive association with number of pods per plant, pod length, number of seeds per pod and 100- seed weight. Similar findings were reported by Singh *et al.* (2009) for number of pods per plant, number of seeds per pod and seed yield per plant. Number of pods per plant showed significant positive association with pod length, number of seeds per pod and 100- seed weight. This was supported by Kumar *et al.* (2003) for number of seeds per pod. Pod length had significant and positive association with number of seeds per pod and 100- seed weight. Number of seeds per pod had significant and positive association with 100- seed weight as reported by Konda *et al*. (2008).

Selection based on correlation without taking into consideration of the interactions between the component characters may sometimes mislead (Codawat, 1980). The estimates of correlation coefficients revealed only the relationship between yield components but did not show the direct and indirect effects of different traits on yield. Association among traits may be due to other components. In order to get direct and indirect effects, path coefficient analysis on seed yield per plant was carried out. The results are presented in Table 2. The residual effect (0.367) indicated that most (63.3%) of the characters related to seed yield per plant were accounted for path analysis.

In the present study, path analysis revealed that number of pods per plant alone depicted high direct effect on seed yield per plant. All other traits recorded negligible direct effect on seed yield per plant. Present result is in accordance with findings of Gupta *et al.* (1982); Rohman and Hussain (2003); Celal (2004); Makeen *et al*. (2007); Rao *et al*. (2006); Hakim (2008). These results clearly indicated that major emphasis need to be given on number of pods per plant for improvement of greengram through interspecific hybridization. Further number of pods per cluster recorded negative direct effect on seed yield per plant which was in accordance with Biradar *et al*. (2007).

Based on the results of present investigation, it can be concluded that number of pods per plant recorded significant and positive association with seed yield per plant. This trait alone recorded high direct effect on seed yield per plant. It also high indirect effect for other traits *viz.*, number of clusters per plant, plant height, number of branches per plant, number of pods per cluster via number of pods per plant on seed yield per plant. And traits viz., pod length and number of seeds per pod had moderate indirect effect on seed yield per plant via number of pods per plant. Hence number of pods per plant can be given top most priority while framing a selection strategy for seed yield improvement in interspecific derivatives of *Vigna radiata* x *Vigna mungo*.

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Table 1. Simple correlation between seed yield per plant and yield component traits in F_5 progenies of interspecific derivatives of *Vigna radiata* x *Vigna mungo*

Characters	Plant height (cm)	No. of. branches/ plant	No. of. clusters / plant	No. of. pods /cluster	No. of. pods/ plant	Pod length (cm)	No. of. seeds / pod	100-seed weight (g)	Seed yield/ plant (g)
Plant height (cm)	1.000	0.468**	0.486**	0.448**	0.587**	0.379**	0.391**	0.147**	0.614**
No. of. branches/ plant		1.000	0.745**	0.258**	0.701**	0.267**	0.252**	0.124**	0.661**
No. of. clusters / plant			1.000	0.239**	0.859**	0.307**	0.267**	0.098**	0.797**
No. of. pods /cluster				1.000	0.475**	0.242**	0.261**	0.139**	0.430**
No. of. pods/ plant					1.000	0.335**	0.308**	0.135**	0.917**
Pod length (cm)						1.000	0.673**	0.201**	0.403**
No. of. seeds / pod							1.000	0.141**	0.382**
100-seed weight (g)								1.000	0.212**
Seed yield/ plant (g)									1.000

** Significant at 1% level of probability.

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Table 2. Path coefficients on seed yield per plant in F_5 progenies of interspecific derivatives of *Vigna radiata* x *Vigna mungo*

Characters / Traits	Plant height (cm)	No. of. branches / plant	No. of. clusters / plant	No. of. pods / cluster	No. of. pods/ plant	Pod length (cm)	No. of. seeds / pod	100-seed weight (g)	Simple correlation with Seed yield/ plant (g)
Plant height (cm)	**0.088**	0.003	0.004	-0.020	0.488	0.014	0.026	0.011	0.614**
No. of. branches/ plant	0.041	**0.007**	0.007	-0.012	0.583	0.010	0.017	0.009	0.661**
No. of. clusters / plant	0.043	0.005	**0.009**	-0.011	0.715	0.011	0.018	0.007	0.797**
No. of. pods /cluster	0.039	0.002	0.002	**-0.046**	0.395	0.009	0.018	0.011	0.430**
No. of. pods/ plant	0.052	0.005	0.008	-0.022	**0.831**	0.012	0.021	0.010	0.917**
Pod length (cm)	0.033	0.002	0.003	-0.011	0.279	**0.037**	0.045	0.016	0.403**
No. of. seeds / pod	0.034	0.002	0.002	-0.012	0.256	0.025	**0.067**	0.011	0.385**
100-seed weight (g)	0.013	0.001	0.001	-0.006	0.113	0.008	0.009	**0.076**	0.214**

Residual effect = 0.367
** -Significant at 1% level of probability