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CORRELATION STUDIES IN BLACK GRAM UNDER PARTIALLY SHADED CONDITIONS

Black gram is cultivated during rabi season in uplands as intercrop in coconut garden and in summer rice fallows. Availability of a variety with high yield potential suited to partially shaded conditions in coconut gardens is a limitation in extending the cultivation of black gram. Leaf area index is an indicator of photosynthetic efficiency as suggested by Nijhawan and Chandra (1980). The nature of association of yield components and the physiological attributes such as leaf area index, photosynthetic efficiency and harvest index helps the breeder in identifying the components which can be used as a reliable selection criteria for the improvement of this crop. Hence, an attempt has been made to study the association of grain yield and its components and other physiological attributes under partially shaded condition in coconut gardens.

A field experiment with 19 varieties of black gram (*Vigna mungo* (L) Hepper), was laid out in the interspaces of coconut garden under partially shaded conditions, adopting a randomised block design with three replications. Five plants were selected at random from each plot and data on number of pod clusters per plant, number of pods per plant, length of pod, number of grains per pod, grain yield per plant, leaf area index (LAI) at 50 per cent flowering, accumulation of dry matter (photosynthetic efficiency) at 50 per cent and 100 per cent flowering, and harvest index were recorded. Correlation coefficients, both at phenotypic and genotypic levels for grain yield per plant and eight other characters and their intercorrelations were estimated. The phenotypic correlaion coefficients were tested for their significance.

Grain yield per plant exhibited positive genotypic correlations with number of pod clusters per plant, number of pods per plant, length of pod, number of grains per pod, leaf area index at 50 per cent flowering, accumulation of dry matter at 50 per cent and 100 per cent flowering and harvest index. The positive genotypic correlations of grain yield per plant with number of clusters per plant, number of pods per plant, length of pod and number of grains per pod were in perfect agreement with the results of Soundarapandian *el al.* (1976) under open conditions of cultivation and with Philip (1987) under partially shaded conditions in black gram.

Identification of potential high yielding genotypes possessing favourable physiological attributes can be used directly or as promising donors for breeding programmes. Seed yield of legume crops is generally related to foliage characteristics like leaf area and photosynthetic efficiency (Johnson and Pendleton, 1968 in soybean, Flinn and Pate, 1970 in field peas). As suggested by Chandrababu *et al.* (1985) in black gram, leaf photosynthesis is one of the basic physiological attributes up on which plant biomass production depends. The plant biomass production is one of the important factors related to seed yield (Uprety *et al.*, 1979).

Leaf area index at 50 per cent flowering, had positive genotypic correlation with grain yield per plant, similar to the result of Philip (1987) in black gram under partially shaded con-

Table 1. Intercorrelations among grain yield per plant and other characters

	No. of pod clusters per plant	No. of pods per plant	Length of pod	No. of grains per pod	LAI at 50 % flowering	Dry matter at 50% flowering	Dry matter at 100% flowering	Harvest index	Grain yield per plant
No. of pod clusters/plant	–	1.284	0.308	0.288	0.741	0.428	0.245	0.854	1.073
No. of pods/plant	0.839*	–	-0.020	1.123	1.177	1.290	0.772	0.713	1.113
Length of pod	0.154	0.171	–	1.257	0.500	-0.146	0.086	0.756	0.564
No. of grains/pod	0.369*	0.339*	0.604*	–	0.070	0.319	0.857	0.547	0.792
LAI at 50% flowering	0.071	0.180	-0.500	0.034	–	0.800	0.834	0.667	0.663
Dry matter at 50% flowering	0.061	0.132	-0.025	-0.041	0.304*	–	0.592	0.169	0.836
Dry matter at 100% flowering	0.258*	0.337*	0.101	0.227	0.414*	0.284*	–	0.041	0.172
Harvest Index	0.227	0.322*	0.149	0.182	0.007	-0.010	0.025	–	1.195
Grain yield/plant	0.799*	0.840*	0.163	0.295*	0.093	0.186	0.194	0.488*	–

Values in the lower and upper triangles are the phenotypic and genotypic correlation coefficients, respectively.

* Significant: at 5 per cent level ** Significant at 1 per cent level

ditions. Similar results of positive genotypic correlation of grain yield per plant with accumulation of dry matter at 50 per cent and 100 per cent flowering were reported by Chandrababu *et al.* (1985) in black gram. The high positive genotypic correlation of harvest index with grain yield per plant observed in the study was in conformity with the reports of Uprety *et al.* (1979) in cowpea. A knowledge of the inter-relationship of dry matter accumulation, harvest index and grain yield is important in the synthesis of new plant types with higher yield potential.

The positive genotypic correlation exhibited by number of pod clusters per plant with number of pods per plant, length of pod and number of grains per pod was in perfect agreement with the results of Sandhu *et al.* (1978) under open conditions and Philip (1987) under partially shaded condiions. The negative genotypic correlation reported between number of pod cluster per plant and leaf area index at blooming by Philip (1987) is in conformity with the present results.

Number of pods per plant recorded positive genotypic correlation with number of grains per pod, leaf area index at 50 per cent flowering, accumulation of dry matter at 50 per cent and 100 per cent flowering and harvest index, while negative genotypic correlation existed with length of pod. Sandhu *et al.* (1978) under open conditions and Philip (1987) under partially shaded conditions in black gram, have also reported positive genotypic correlation of number of pods per plant with number of grains per pod, in conformity with the results of the present study.

In this study length of pod showed positive genotypic correlation with number of grains per pod, leaf area index at 50 per cent flowering, dry matter accumulation at 100 per cent flowering and harvest index. The positive genotypic correlation between length of pod and number of grains per pod observed was in conformity with the results of Sandhu *et al.* (1978) under open conditions and Philip (1987) under partially shaded conditions in black gram. This is quite logical because as the length of pod increases the number of grains per pod also increases. LAI at 50 per cent flowering exhibited positive genotypic correlation with accumulation of dry matter at 50 per cent and 100 per cent flowering and harvest index. This indicates that increase in LAI will result in higher phtosynthetic efficiency and harvest index. Accumulation of dry matter at 50 per cent flowering also exhibited positive genotypic correlation with accumulation of dry matter at 100 per cent flowering and harvest index.

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REFERENCES

Chandrababu, R., Sadasivam, R., Natarajaratnam, N. and Sreerangaswamy, S.R. 1985. Photosynthesis in relation to yield potential in black gram. *Madras agric. }.* 72 : 152-155

Flinn, A.M. and Pate, J.S. 1970. A quantitative study of carbon transfer from pod and substending leaf to the ripening seeds of field peas. (*Pisum arvensis* L). /. *cxpt. Rot.* 21 : 71-82

Johnston, T.J. and Pendleton, T.W. 1968. Contribution of leaves at different levels to seed production of upright and ledged soybean (*Glycine max L.* Merr). *Crop Sci.* 8 : 291- 292

Nijhawan, D.C. and Chandra, S. 1980. The physiology of plant growth with particular reference to the concept of photosynthetic efficiency in mung bean. (*Vignaradiata* Roxb. Wilczek). *Indian]. Pl. Physiol. 23* : 40-46

Philip, G. 1987. Model for selecting black gram (*Phaseolus mungo* Roxb) varieties for yield and adaptability under partial shade. M.Sc.(Ag) thesis, Kerala Agric. Univ., Trichur

Sandhu, T.S. Bhullar, B.S., Cheema, H.S. and Brar, J.S. 1978. Grain protein, yield and its components in urd bean. *Indian]. Genet.* 38 : 410-415

Soundarapandian, G., Nagarajan, P., Mahudeswaran, K. and Marappan, P.V. 1976. Genotypic and phenotypic correlations and path analysis in black gram *Madras agric. f.* 63 : 141-147

Uprety, D.C. Tomar, O.P.S. and Sirohi, G.S. 1979. A note on the yild determining factors in cowpea. (*Vigna unguiculata*) varieties. *Indian J. PL Physiol. 22* : 156-159

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