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Association of proportion of pod wall with seed yield and some yield attributes in greengram [*Vigna radiata* (L.) Wilczek]

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ABSTRACT

Partitioning of dry matter into economic and uneconomic parts has long been acknowledged as an important physiological process determining yield in most of the grain crops particularly in blackgram and greengram. Proportion of podwall to pod yield has been found to be very high in greengram. Significant increase in seed yield could be attained if excess dry matter of podwall is translocated to seed. However, the knowledge of relationship of this trait with seed yield and other yield attributes is a prerequisite for such a programme. In the present work eight genotypes of greengram were grown in RBD with three replications in 2004 and the genotypic correlations among proportion of podwall, pods / plant, seeds / pod, biological yield, harvest index, 100 seed weight and seed yield were estimated and path-coefficient analysis was done. Proportion of pod wall showed significantly positive correlations with pods / plant, seed / pod and significantly negative correlation with 100-seed weight. Correlation between proportion of pod wall and seed yield was not significant. Path analysis showed high negative direct effect of proportion of pod wall on seed yield. While pod / plant showed high positive direct effect, 100 seed weight showed high negative direct effect on seed yield. Future breeding programme in relation to this trait is discussed.

Key words : Dry matter partition, Podwall proportion, Correlation, Greengram

The main factor responsible for the lower grain yield in legumes is their poor harvest index. Pulse crops are very inefficient in partitioning the photosynthates from uneconomic parts into economic part or grains unlike cereals. Significant amount of dry matter is further retained in the podwall not being translocated into seeds. Proportion of pod wall to pod yield and even to biological yield is very high. Significant increase in seed yield might be attained if the excess dry matter retained in the podwall could be translocated into the grains. However, the knowledge of relationship of this trait with seed yield and other yield attributes is a prerequisite for taking up such a programme. In the present work, the relationships of this trait with seed yield and other yield attributes have been investigated and future breeding programme in relation to this trait is discussed.

MATERIALS AND METHODS

Eight diverse genotypes of greengram were grown in 2 rows of 2 m. length in a Randomized Block Design with three replications in the summer season (Feb.-May) in 2004 in 'C' Block, District Seed Farm, Kalyani, B.C.K.V. Row to row and plant to plant distances were kept 30 cm and 10 cm respectively. Basal dose of NPK at the rate of 20 : 30 : 30 Kg / ha was applied and regular cultural operations were undertaken. Ten plants at random from each genotype per replication were harvested and data on pods per plant, seeds per pod, biological yield, pod yield, husk yield, seed yield and 100 seed weight were recorded. Proportion of pod wall was calculated from (pod weight / plant – seed weight / plant) ÷ pod weight / plant. Genotypic correlation and genotypic path coefficient analysis were done following the method of Dewey and Lu (1959).

Seed yield / plant showed significantly positive genotypic correlation only with pods / plant and biological yield (Table 2). Its correlations with all other traits were positive but non-significant. Proportion of podwall showed negative correlation with 100-seed weight. Proportion of podwall did not show significant correlation with seed yield, therefore, it could be manipulated without affecting seed yield. Hundred seed weight although did not show significantly positive correlation with seed yield but its significant negative correlation with proportion of

podwall indicated that selection for heavier seed weight would reduce the podwall proportion and contribute to higher seed yield. It might be possible that as there was little variability in the sink in the form of number of seeds / pod and seed size, the mobilization of source to the sink was restricted and stored in the pod wall. This indication found indirect support from the significant negative correlation between proportion of podwall and 100 seed weight which implied that if seed size is increased podwall proportion may decrease.

Cause and effect relationship was further explained by the path-coefficient analysis (Table 3). While pods / plant, biological yield and harvest index showed positive direct affect, 100 seed weight, podwall proportion and seeds / pod showed negative direct effect on seed yield / plant. Hundred seed weight showed insignificant correlation with seed yield / plant but its direct effect on seed yield was high and negative which was mainly contributed via indirect effect of pods / plant. This relation seemed to be allometric in nature and therefore manipulating proportion of podwall to enhance seed yield might be possible.

Table 1 Mean values of different characters of eight greengram lines

Lines	Pods / plant	Seeds / pod	Proportion of pod wall	Biological yield (g)	Harvest index	100 seed weight (g)	Seed yield / plant (g)
1. Local mung	23.2	12.4	0.34	11.8	0.33	1.89	3.99
2. TARM-2	29.1	11.5	0.33	16.5	0.35	3.46	5.81
3. Kathmandu Collection	14.2	9.8	0.30	9.5	0.42	3.47	3.88
4. Early – 88	17.7	11.4	0.33	11.2	0.35	3.03	3.97
5. Lobed leaf	13.0	12.3	0.33	12.4	0.26	2.83	3.33
6. F. G. 72	15.4	11.4	0.31	11.2	0.37	3.48	4.73
7. Early – 55	15.2	10.5	0.32	10.8	0.32	3.31	3.59
8. A 143	8.4	11.2	0.30	12.9	0.30	5.41	3.97
Grand Mean	17.02	11.31	0.32	12.04	0.34	3.36	4.15
CD at 0.05	5.3	0.67	0.003	2.31	0.003	0.34	1.24

Table 2. Genotypic correlation coefficients among different characters in greengram

Characters	Seeds / pod	Proportion of pod wall	Biological yield	Harvest index	100 seed weight	Seed yield / plant
Pods / plant	0.272	0.863**	0.639	0.212	–0.571	0.758*
Seed / pod		0.851**	0.556	–0.894**	–0.433	0.024
Proportion of pod wall			0.496	–0.309	–0.889**	0.328
Biological yield				–0.338	0.180	0.821**
Harvest index					–0.083	0.243
100 seed weight						0.084

*, ** Significant at 5% and 1% respectively

Table 3 Direct (underlined) and indirect effects of different yield attributing characters on seed yield in greengram at genotypic level

Characters	Pods / plant	Seeds / pod	Proportion of pod wall	Biological yield	Harvest index	100 seed weight
Pods / plant	5.70	– 0.173	– 1.118	0.830	0.180	2.535
Seed / pod	1.553	– 0.634	– 1.102	0.722	– 0.759	1.923
Proportion of pod wall	4.921	– 0.540	– 1.294	0.643	– 0.262	3.947
Biological yield	3.644	– 0.353	– 0.642	1.298	– 0.287	– 0.799
Harvest index	1.210	–.567	– 0.400	– 0.438	0.849	0.370
100 seed weight	–3.256	–0.275	1.151	0.234	– 0.071	– 4.438

Residual effect : = 0.0625

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