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Yield Partitioning in High Yielding Mungbean (*Vigna radiata* (L.) Wilczek)

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ABSTRACT

Correlation and path - coefficient were studied in 10 mungbean (*Vigna radiata* (L.) Wilczek) genotypes. Positive correlation was observed between grain yield and 1000-seed weight. Branches per plant was negatively correlated with grain yield. Correlation between branches per plant and 1000-seed weight was negligible. The path-coefficient analysis indicated that 1000-seed weight had a high total correlation and a high direct effect on grain yield. Direct contribution of seed size toward grain yield was the highest, but it was appreciably influenced via pods per plant, days to maturity, plant height and clusters per plant. Despite the highest total negative correlation between branches per plant and grain yield per plant, the direct effect was negligible. Clusters per plant had no correlation with plant yield. Ultimately, 1000-seed weight alone qualifies as the best index for selection of genotypes in a mungbean breeding program.

Key words : yield components, mungbean, *Vigna radiata*

INTRODUCTION

Most mungbean breeding programs aim at higher seed yield, which is a complex trait constituting several components jointly contribute to the final yield. An alternative approach is to improve mungbean seed yield components rather than total yield. However, to increase seed yield based on correlation studies, it is important that selection to increase one trait does not lead to deterioration in another trait.

Malhotra *et al.* (1974) found that yield was strongly associated with number of pods per plant and clusters per plant in greengram. Whereas Yohe and Poehlman (1975) reported that number of pods per plant and 1000-seed weight were the most important yield contributing characters in mungbean. In 1981 Rani and Rao found the same results in black gram as Yohe and Poehlman found in mungbean, but Zubair and Srinives (1986) reported that substantially high correlations, though statistically non-significant, were obtained between yield and branches per plant, and yield and pods per plant in mungbean. The variation reported by Malhotra *et al.* (1974), Yohe and Poehlman (1975), and Zubair and Srinives (1986) could be attributed to the genetic difference of the cultivars as well as climatic and edaphic factors affecting growth and development during studies. The present study was taken up for further elucidation to find the relationships between yield and yield components in mungbean through path-coefficient analysis.

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MATERIALS AND METHODS

The experiment was conducted during 1994-95 on the field of ARC/AVRDC, located at Kamphaeng Saen Campus, Kasetsart University, Thailand. Ten genotypes of high yielding mungbean, viz. Var. 6601, NM 36, NM 92, from NIAB-Pakistan and VC 1973A, VC 2768B, VC 1560A, VC3902A, VC6144, VC6168, VC6173A, from ARC/AVRDC, Thailand, were chosen based on their variability. The experiment was conducted in a randomized complete block design (RCBD) with three replications. Plant to plant and row to row spacings were maintained at 10 and 50 cm, respectively. Each plot consisted of six rows each with a length of 5 m. Data were recorded on the basis of 5 randomly selected plants per plot for the characters, viz. days to 50% flowering and maturity, plant height, branches per plant, clusters per plant, pods per plant, seeds per pod, 1000-seed weight and yield per plant. Analysis of variance was made for each character separately. Phenotypic linear correlation coefficient for all possible comparisons were calculated. The significant correlation coefficients were partitioned into direct and indirect effects.

RESULTS AND DISCUSSION

Significant differences were observed among the genotypes for days to 50% flowering and maturity, plant height, pods per plant, 1000-seed weight, and plant grain yield (Table 1). Whereas non-significant differences were observed for branches per plant, clusters per plant, and seeds per pod.

Correlation coefficient

Yield per plant showed positively significant association (r=0.665) with 1000-seed weight (Table 2). No correlation was found between clusters per plant and grain yield. Similar results of a positive association between yield per plant with 1000-seed weight was reported in black gram by Rani and Rao (1981) and in greengram by Gupta and Singh (1969). Malhotra *et al.* (1974), however reported no correlation of plant yield with 1000-seed weight, whereas Zubair and Srinives (1986) reported non-significant association between 1000-seed weight and plant yield. The non-significant association between yield and clusters per plant in the present study confirmed the results of Rani and Rao (1981) but in contrary to the results reported by Zubair and Srinives (1986). This may be attributed to the differences in evaluation time and the materials studied. In the present study yield per plant had no association with days to 50% flowering, maturity, plant height, pods per plant, seeds per pod and branches per plant, which was contrary to the findings of Rani and Rao (1981) Gupta and Singh (1969), Malhotra *et al.* (1974), and Zubair and

Table 1 Mean square values from ANOVA of yield and yield components of 10 high yielding mungbean genotypes.

S.O.V.	Days to 50% flowering	Days to 50% maturity	Plant height (cm)	Branch per plant	Cluster per plant	Pods per plant	Seeds per pod	1000-seed weight (gm)	Yield per plant
Block	4.93	8.93	21.49*	0.29*	0.15	2.19	0.09	6.33	0.03
Treat.	35.17**	61.26**	178.70**	0.10	0.69	23.38*	0.87	498.89**	1.68**
Error	1.97	2.27	26.55	0.06	0.69	7.59	0.88	7.45	0.32

** Significant at P = 0.01, *Significant at P = 0.05

Srinives (1986). A negative association of maturity with plant yield suggested that the present trend toward breeding for short duration genotypes may not be the best way to exploit yield potential of high yielding mungbean.

Path-coefficient analysis

The 1000-seed weight was the major variable, having a high total correlation (0.550) and also a high direct effect (0.796) on yield per plant. The high positive direct effect of this character was much reduced by the negative indirect effect of days to maturity, plant height and pods per plant. Singh and Malhotra (1970) studied in greengram and reported similar results of a high direct effect of 100-seed weight on yield, which was reduced to

Table 2 Correlation coefficients among eight characters of 10 high yielding mungbean genotypes.

Parameters	Days to 50% maturity	Plant height (cm)	Branch per plant	Cluster per plant	Pods per plant	Seeds per pod	1000-seed weight (gm)	Yield per plant
Flowering (50%)	.934**	.279	.662*	-.477	-.405	.175	.266	-.271
Maturity (50%)		.247	.544	-.374	-.326	-.016	.254	-.201
Plant height			.476	-.244	-.396	.253	.258	-.349
Branches/Plant				-.067	.049	.547	-.348	-.823**
Clusters/Plant					.714*	-.160	-.414	.075
Pods/Plant						.204	-.765**	-.224
Seeds/Pod							-.487	-.573
1000-seed weight								.665*

** Significant at P = 0.01,* Significant at P = 0.05

Table 3 Path-coefficient analysis of yield with other agronomic characters in 10 high yielding mungbean.

Influence on yield through	Days to 50% flowering	Days to 50% maturity	Plant height (cm)	Branch per plant	Cluster per plant	Pods per plant	Seeds per pod	1000-seed weight (gm)	Total corre lation
Flowering (50%)	<u>.157</u>[1]	-.403	-.069	-.066	.027	-.136	-.300	.212	-.578
Maturity (50%)	.147	<u>0.431</u>	-.061	-.054	.021	-.109	.003	.202	-.282
Plant height	.043	-.106	<u>-.246</u>	-.047	.014	-.133	-.043	.205	-.191
Branches/Plant	.104	-.243	-.117	<u>-.099</u>	.004	.016	-.092	-.277	-.695
Clusters/Plant	-.075	.161	.060	.007	<u>-.057</u>	.239	.027	-.330	.032
Pods/Plant	-.064	.141	.097	-.005	-.041	<u>.335</u>	-.034	-.609	-.180
Seeds/Plant	.027	.007	-.062	-.054	.009	.068	<u>-.169</u>	-.388	-.562
1000-seed weight	.042	-.109	-.063	.034	.024	-.256	.082	<u>.796</u>	.550

[1] Underlined figures denote path-coefficients and direct effects; the rest of figures denote indirect effect.

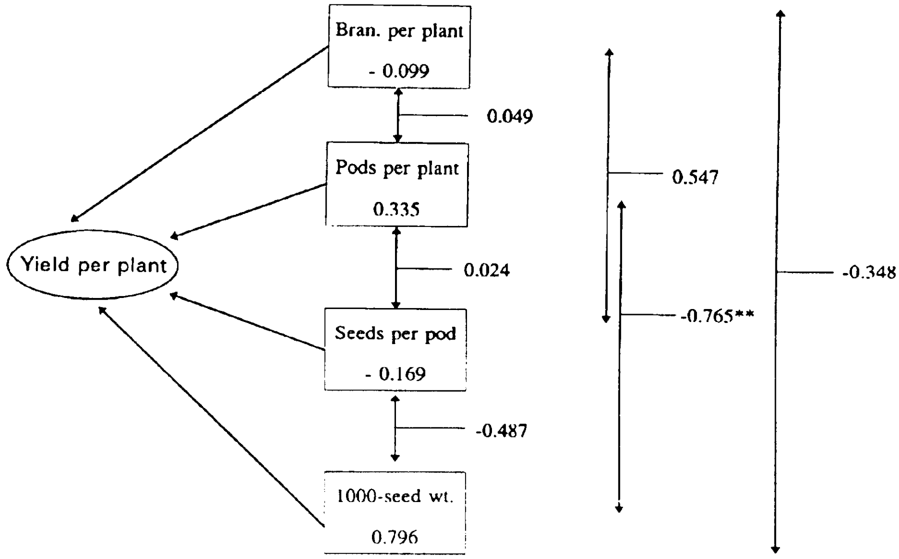

Figure 1 Diagrammatic depiction of the effects of yield components on plant yield. Double arrows show correlation coefficients, single arrows show path-coefficients.

about 50% by a negative indirect effect via pods per plant. Clusters per plant had neither direct effect (-0.057) nor total correlation (0.032) on seed yield, which was mainly supplemented indirectly via pods per plant (0.239). A similar result of supplementing the total correlation of clusters per plant by indirect effect of pods per plant was also reported by Zubair and Srinives (1986). Days to maturity, plant height, branches per plant, pods per plant and seeds per pod had negative direct effect and total correlation with plant yield.

It is concluded by the present study that seed size and clusters per plant should be given the maximum consideration for yield improvement and that an appropriate selection index should be adapted so that advance in one yield component is not nullified by deterioration in the other.

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