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1) Dry matter yield and branching ability as selection parameters in soybean.

During the process of varietal development, a large number of new breeding lines of soybean (PK-series) generated through hybridization and selection are evaluated each year at this centre and elite ones (about 40) are maintained for further use. A brief report of some of these lines has been published (Ram et al., 1982). A path-coefficient analysis using typical yield components and the physiological parameters of yield, viz. dry matter yield (above ground parts), harvest index and seed yield efficiency, was carried out in 50 soybean genotypes (40 new PK-series lines + 10 parental/check cultivars) evaluated during rainy season 1980. The results are summarized in Table 1.

Table 1. Phenotypic, genotypic correlations and corresponding direct effects of 16 quantitative traits with seed yield in soybean

Characters	Phenotypic		Genotypic	
	Correlation	Direct effect	Correlation	Direct effect
Days to flower	-0.210	-0.134	-0.282	2.339
Days from flowering to maturity	0.354*	-0.078	0.515	0.258
Days to maturity	0.180	0.029	0.215	0.081
Basal-node height (cm)	-0.016	-0.028	-0.000	0.412
Basal-pod height (cm)	0.022	-0.008	-0.325	-0.898
Leaflet width (cm)	0.331*	0.003	0.565	-1.109
Leaflet length (cm)	0.353*	0.057	0.611	0.523
Plant height (cm)	-0.294*	-0.000	-0.393	1.186
Number of primary branches per plant	0.443**	0.058	0.436	0.479
Number of pods/plant	-0.128	0.230	-0.307	0.136
Number of seeds/pod	-0.210	-0.021	-0.396	-1.550
Number of nodes/plant	-0.110	-0.015	-0.281	-3.727
100-seed weight (g)	0.372**	0.026	0.513	-1.609
Dry-matter weight/plant (g)	0.639**	0.763	1.048	1.171
Harvest index	0.557**	0.665	1.046	0.301
Seed yield efficiency	0.491**	0.073	1.937	-0.017

*,** Significant at 5 and 1 percent probability, respectively.

The traits having significant positive phenotypic correlations with seed yield, and also supported by the genotypic correlations, were days from flowering to maturity, leaflet width, leaflet length, number of primary branches, 100-seed weight, dry-matter weight, harvest index, and seed yield efficiency. Plant height was negatively correlated with seed yield.

The physiological parameters of seed yield, viz. harvest index (seed yield/above ground plant dry weight) and seed yield efficiency (seed weight/above ground nonseed dry weight), are directly related to dry-matter yield which has shown positive correlation with seed yield. Joshi and Smith (1978) have also suggested that selection based on unthreshed weight should be helpful in improving soybean yield. The significance of dry-matter yield, harvest index, seed yield efficiency, number of primary branches, leaflet length, and 100-seed weight in determining seed yield was obvious through path-coefficient analysis also as these components had substantial direct effect upon seed yield both at phenotypic and genotypic level.

Breeding implications: In light of these results and practical feasibility during the process of selection, it is suggested that dry-matter weight and number of primary branches/plant should get priority for yield improvement. Dry-matter weight proved to be of further importance since it had high genotypic correlation with harvest index (r_g = 1.452) and seed yield efficiency (r_g = 3.085) which, in turn, had strong association with seed yield. Dry-matter weight had another advantage in that it was positively correlated with number of primary branches/plant (r_p = 0.378, r_g = 0.390), which itself was observed to be an important seed yield determinant.

Branching ability should also be considered as an important trait while selecting varieties of high yield potential for tropical and subtropical environment. High branching varieties may have the ability to compensate for poor plant stand by producing more branches/plant under less plant competition. Singh (1976) has suggested that the plants with intermediate height (75-90 cm), with 8-10 branches, having narrow leaves and seed size in the range of 12-15 g/100 seeds seem to be the ideal plant types for tropical regions. Most of the breeding lines studied by us were in this branching (8-10 branches/plant) range. However, our observations do not support the advantages of narrow leaflets to increase seed yield in soybean. Mandl and Buss (1981) evaluated the effect of leaflet shape on the agronomic performance of soybean lines by using narrow and broad leaflet isolines with varied genetic backgrounds. Analysis over years showed that the narrow leaflet lines were significantly shorter and had smaller seeds. Lodging scores were similar for both the leaflet types. They concluded that narrow leaflet trait offers neither a yield advantage nor disadvantage compared with the broad leaflet trait.

Thus, in conclusion, we suggest that dry matter yield, branching ability and preferably broader leaflets should be the selection parameters in soybean in the tropics.

References

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