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Selection Criteria in Summer Mungbean (*Vigna radiata* (L.) Wilczek)

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ABSTRACT

Forty four (44) diverse genotypes of mungbean were evaluated in a randomized block design with four replications during summer, 1986. Wide range of variability was noticed for all characters as evidenced by range. Higher magnitude of GCV and PCV was also observed for seed yield, branches per plant, pods per plant, pod length, bunches per plant and pods per bunch. Pod length followed by days to flowering, pods per plant and days to maturity showed highest heritability whereas pods per plant, pod length, pods per bunch and bunches per plant exhibited very high magnitude of genetic advance as percentage of mean. Seed yield was positively correlated with pods per plant, bunches per plant and pods per bunch. Path coefficient analysis indicated that the bunches per plant, pod length and pods per bunch are the important yield components in mungbean during summer.

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INTRODUCTION

The mungbean (*Vigna radiata* (L.) Wilczek var. radiata (Verdc.) is an important pulse crop having good potential to meet the rising demand of pulses. It contains very high protein content and gives better yield during summer. To develop high yielding varieties specifically suited to summer, it was considered worth-while to collect information on genetic variability and character associations which are of vital importance for initiating crop improvement programme and are very rare especially under summer conditions.

MATERIALS AND METHODS

The materials for the present investigation consisting of 44 diverse genotypes of mungbean was raised in a randomized block design with four replications during summer 1986 at Gujarat Agricultural University, Derol. The plot size consisted of single row of 5 m length following the specings of 30 cm and 10 cm between rows and plants, respectively. The cultivation practices in vogue were followed for raising the crop. Five plants were randomly chosen in each replication and observations were recorded on seed yield (g/plant), days to flowering and maturity, plant height (cm), branches per plant (no.), pods per plant (no.), pod length (cm), seeds per pod (no.), bunches per plant (no.) and pods per bunch (no.). Mean data were utilized for statistical analysis of heritability in broad sense (Johnson *et al.* 1995a), genetic advance (Lush, 1948), phenotypic and genotypic correlations (Johnson *et al.* 1955b), and path coefficient analysis (Dewey and Lu, 1959).

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RESULTS AND DISCUSSION

The results obtained under the investigation are presented in Table 1 to 3.

The data on genetic variability (Table 1) indicated the higher range of variation for pods per plant and plant height. Besides, other characters also exhibited high degree of variability in the material. The high genotypic and phenotypic coefficient of variation was observed for pods per plant followed by pod length, pods per bunch, bunches per plant, branches per plant and seed yield. Pod length had the highest heritability followed by days to flowering, pods per plant and days to maturity. Other characters viz. seeds per pod and pods per bunch also exhibited moderately high heritability. The data further revealed that pods per plant followed by pod length, pods per bunch and bunches per plant showed high genetic advance as percentage of mean. Branches per plant, seed yield, plant height and seeds per pod also exhibited substantial genetic advance as percentage of mean. High to medium extent of heritability and genetic advance were also reported by Ali and Saikh (1987), Pandey *et al.* (1988) and Pundir *et al.* (1992) in mungbean. Thus, the trait pod length followed by pods per plant, pods per bunch and bunches per plant showed high heritability followed by high genetic advance, a condition most effective for selection. This condition appears due to additive gene action while days to flowering and days to maturity, possessed high heritability but low genetic advance resulting due to non additive gene action (Liang and Walter, 1968).

TABLE 1

Genetic variability, heritability and genetic advance for 10 characters in mungbean.

Character	*Range*	*General Mean*	*GCV (%)*	*PCV (%)*	*h^2 (%)*	*G.A. as% of mean*
Seed yield/plant	2.10 — 8.63	5.17	17.17	36.95	21.60	16.44
Days to flowering	50.0 — 61.50	54.22	4.33	4.99	75.35	7.75
Days to maturity	71.0 — 80.0	75.11	2.24	2.72	67.53	3.78
Plant height	33.0 — 70.0	51.79	11.68	18.00	42.06	15.60
Branches/plant	1.50 — 4.50	2.18	18.18	29.77	37.27	22.86
Pods/plant	9.5 — 40.6	21.59	33.61	40.43	69.12	57.57
Pod length	6.17 — 13.00	8.21	24.69	25.14	96.48	49.93
Seeds/pod	8.8 — 14.0	10.71	9.92	13.22	56.25	15.31
Bunches/plant	4.5 — 12.2	7.20	20.29	29.22	48.22	29.03
Pods/bunch	1.55 — 4.80	3.26	23.80	31.84	55.85	36.50

The results on correlation studies (Table 2) indicated that the genotypic and phenotypic correlations followed the same trend and that the genotypic correlations were, in general, higher than the phenotypic correlations. The seed yield was strongly

TABLE 2

Genotypic (upper diogonol) and phenotypic (lower diagonal) correlation coefficients between different characters in mungbean.

Character	*Seed yield*	*Days to flowering*	*Days to maturity*	*Plant height*	*Branches/ plant*	*Pods/ plant*	*Pod length*	*Seeds/ pod*	*Bunches/ plant*	*Pods/ bunch*
1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*	*9.*	*10.*	*11.*
Seed yield	—	-0.510**	-0.167	-0.668**	-0.212	0.850**	-0.544**	-0.321	0.870**	0.394**
Days to flowering	-0.345*	—	0.499**	1.253**	0.105	-0.640**	0.689**	0.525**	-0.326*	-0.814**
Days to maturity	-0.082	0.420**	—	0.689**	0.217	-0.186	0.434**	0.293*	0.161	-0.369*
Plant height	0.033	0.488**	0.237	—	0.290*	-0.649**	0.778**	0.324*	-0.287	-0.959**
Branches/plant	0.142	0.056	0.056	-0.036	—	0.249	0.241	0.457**	0.590**	-0.140
Pods/plant	0.493**	-0.529**	-0.152	-0.203	0.251	—	-0.722**	-0.233	0.812**	0.877**
Pod length	-0.219	0.572**	0.357*	0.531**	0.153	-0.587**	—	0.593**	-0.403**	-1.032**
Seeds/pod	0.039	0.233	0.219	0.241	0.182	-0.140	0.499**	—	0.102	-0.646**
Bunches/plant	0.499**	-0.282	0.088	0.062	0.419**	0.781**	-0.268	-0.002	—	0.509**
Pods/bunch	0.413**	-0.504**	-0.151	-0.355*	-0.088	0.632**	-0.741**	-0.295	0.376*	—

* P = 0.05 ; ** P = 0.01

TABLE 3

Path co-efficient analysis showing direct and indirect effects of g characters on seed yield in mung.

Character	*Days to flowering*	*Days to maturity*	*Plant height*	*Branch/ plant*	*Pods/ plant*	*Pod length*	*Seeds/ pod*	*Bunches/ plant*	*Pods/ bunch*	*'rg' with seed yield*
1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*	*9.*	*10.*	*11.*
Days to flowering	**0.5570**	-0.573	-0.009	-0.224	0.146	2.001	-0.300	-1.061	-1.044	-0.510
Days to maturity	0.278	**-1.148**	-0.005	-0.463	0.031	1.258	-0.167	0.523	-0.473	-0.167
Plant height	0.679	-0.791	**-0.007**	-0.620	0.148	2.257	-0.185	-0.934	-1.230	-0.668
Branch/plant	0.058	-0.249	-0.002	**-2.139**	0.056	0.699	-0.262	1.919	-0.180	-0.212
Pods/plant	-0.356	0.156	0.005	-0.531	**-0.229**	-2.095	0.133	2.643	1.124	0.850
Pod length	0.384	-0.498	-0.006	-0.515	0.165	**2.902**	-0.339	-1.312	-1.323	-0.544
Seeds/pod	0.292	-0.336	-0.002	-0.977	0.053	1.721	**-0.573**	0.331	-0.829	-0.321
Bunches/plant	-0.181	-0.184	0.002	-1.260	-0.185	-1.170	-0.058	**3.256**	0.653	0.870
Pods/bunch	0.453	0.423	0.007	0.300	-0.200	-2.995	0.370	1.658	**1.283**	0.394

* The darkened figures denote the direct effects.

* The residual effect = 0.454

and positively correlated with pods per plant, bunches per plant and pods per bunch both at genotypic and phenotypic levels. Mishra and Sahu (1985), Roshnaiah *et al.* (1987), Sandhu *et al.* (1988) and Naidu *et al.* (1991) also observed significant and positive association of grain yield with cluster and pods per plant in greengram. Sandhu *et al.* (1988), however, reported positive and significant association of pod length and seeds per pod with grain yield in greengram which are not in conformity to the results of the present study. It was observed that days to flowering and days to maturity with each other and also with plant height, pod length and seeds per pod; branches per plant with seeds per pod and bunches per plant; pods per plant with bunches per plant and pods per bunch; pod length with seeds per pod; and bunches per plant with pods per bunch showed significant positive association. Significant negative correlation of days to flowering and absence of correlation of days to maturity with seed yield indicated that it would be possible to develop high yielding and early maturing genotypes of mungbean better suited to summer conditions.

The path coefficent analysis carried out to estimate the direct and indirect effects of various characters on seed yield revealed that bunches per plant followed by pod length,pods per bunch and days to flowering had the highest positive direct effects (Table 3). Remaining characters showed negative direct effects. Pods per plant by Chand *et al.* (1975) in gram, Tikka *et al.* (1977) in mothbean, and days to maturity followed by clusters per plant and pod length by Wanzari (1988) in blackgram reported as important yield components as they gave the highest direct positive effect.

It was interesting to note that pods per plant which showed significant positive correlation with seed yield gave negative direct effect whereas days to flower and pod length which showed strong negative correlations exhibited positive direct effect for seed yield. The data further revealed that days to maturity contributed through its indirect effect via pod length, and bunches per plant whereas plant height via pod length and days to flowering; branches per plant via bunches per plant and pod length, pods per plant via bunches per plant and pods bunch and seeds per pod via pod length mainly contributed towards seed yield. The indirect contribution of days to flower via pod length; bunches per plant via pods per bunch and pods per bunch via bunches per plant were also high and positive.

The overall study revealed wide range of variability for all the characters under study. High heritability followed by higher magnitude of genetic advance as percentage of mean for important traits like pods per plant, pod length, seeds per pod, bunches per plant and pods per bunch indicated that improvement in these traits can be rapidly brought about through selection. Highly significant positive association of bunches per plant and pods per bunch with seed yield at genotypic level and their high positive direct effect on seed yield indicated that these characters are the most important yield components which can be utilized as indirect selection criteria for the improvement of seed yield in mungbean during summer. However, for recommending broad based and reliable selection indices the indirect contribution of other important characters viz., branches per plant, pods per plant and seeds per pod should also be taken into consideration.

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