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# RELATIONSHIP BETWEEN YIELD AND YIELD COMPONENTS IN INDUCED MUTANTS OF MUNG BEAN

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**Abstract**

Influence of altered plant type on the interrelationship among yield and its components was studied in 28 mutant lines of mung bean. Plant height exhibited positive correlation with yield per plant showing deviation from the previously reported correlation studies.

Number of pods per plant, length of pod and number of grains per pod showed positive correlation with yield per plant. Highly positive correlation was found between length of pod and number of grains per pod. Correlation between number of pods per plant and pod length, and number of pods per plant and number of grains per pod was non significant while correlation between protein and 100 grain weight was positive and protein percentage showed negative correlation with number of grains per pod.

## Introduction

Yield of present day cultivars of mung bean (*Vigna radiata* L.) is poor primarily due to excessive vegetative growth under improved cultural practices and favourable moisture conditions. A major reconstruction in the plant type is needed to ensure good return to the farmers in order to check the increasing trend of replacing the area conventionally grown under legumes by new high yielding varieties of cereals (Swaminathan, 1978).

In mung bean genetic variability for plant type, growth habit and high yielding ability is scanty, however significant amount of genetic variability in the desired direction has been induced in populations resulting from the use of various mutagens (Shakoor *et al.* 1978).

Grain yield is a factor of interaction of several yield components influenced by environmental conditions (Rubaihayo, 1973) and a genetic change may influence this relationship (Ojomo & Cheda, 1972). By using pod per plant as selection index, from the irradiated population they improved yield in cowpea.

The aim of present study was to determine the influence of altered plant type on the interrelationship among yield and its components. Such information will facilitiate single plant selection from a segregating population in an induced mutation breeding programme.

## Materials and Methods

The studies were carried out at Nuclear Institute for Agriculture and Biology, Faisalabad during spring 1976. Twenty eight elite mutant lines in $M_4$ generation, selected primarily on the basis of improved plant type, growth habit and yield were used in this study. These mutant lines alongwith two commercial cultivars 6601 and Pak 22, were space planted in a randomized block design with four replications. A distance of 15 cm was maintained between the plants and 30 cm between the adjacent rows. Each plot measured 3.6 x 1.5 m. Two seeds were dibbled per hill and after germination were thinned to one seedling per hill to ensure good stand.

At harvest, ten guarded plants per plot in each replication were sampled at random for recording data on plant height, number of pods per plant, pod length number of grain per pod, 100 grain weight and grain yield per plant. Bulked seed of each plot were used to determine protein contents by microkjeldahl method.

**TABLE 1. Morphological characteristics of 28 elite mutant lines and two parent cultivars.**

| Cultivar/ Mutant line | Plant height (cm) | Nomber of pods/plant | Length of pod (cm) | Number of grain/ pod. | 100 grain weight (gm) | Yield/ plant (gm) | Harvest index (%) |
|---|---|---|---|---|---|---|---|
| 605 | 40.33 | 26.7 | 6 97 | 9 67 | 4 06 | 6.69 | 30.46 |
| 620 | 40.05 | 30 8 | 6.93 | 9.42 | 3 96 | 8.43 | 30.71 |
| 622 | 36.33 | 19.9 | 7.23 | 9.63 | 3.90 | 5.07 | 28 16 |
| 678 | 36.98 | 30.6 | 7 44 | 9 55 | 4.03 | 6.48 | 29 94 |
| 792 | 40.48 | 28.4 | 7 31 | 9 45 | 3 96 | 7 88 | 28.92 |
| 803 | 39.00 | 29.3 | 7.34 | 9.58 | 4 00 | 7.21 | 32.73 |
| 883 | 39 15 | 25.6 | 7 28 | 9.68 | 4.03 | 6.95 | 26.63 |
| 892 | 38.88 | 29.7 | 7 28 | 9 41 | 3.93 | 7 31 | 28.70 |
| 1000 | 39.10 | 27.8 | 7.40 | 9.56 | 3 90 | 7 11 | 31.88 |
| 1038 | 41.58 | 27 7 | 6.87 | 9.60 | 3.90 | 6 62 | 27.19 |
| 1062 | 34.65 | 26.3 | 6 99 | 9.42 | 4.00 | 6 11 | 30 42 |
| 1118 | 33.50 | 25.6 | 7 50 | 10 01 | 3.83 | 7.21 | 35 26 |
| 1140 | 40.58 | 34.6 | 7.22 | 9.56 | 3.96 | 7.83 | 33 17 |
| 1930 | 41 15 | 30.6 | 7.35 | 9.68 | 3.90 | 7.78 | 24.52 |
| 1948 | 41.25 | 27.9 | 7.33 | 9.58 | 3 96 | 6 24 | 28.91 |
| 1978 | 37.95 | 27.0 | 7.20 | 9.24 | 3 93 | 6 31 | 25.48 |
| 2070 | 42 18 | 28.4 | 7.33 | 9 62 | 3.83 | 6.89 | 34.41 |
| 2172 | 35.33 | 28.3 | 6.81 | 9.14 | 3.93 | 6.10 | 23.41 |
| 2174 | 39 05 | 26.6 | 7.33 | 9.71 | 3.93 | 6.17 | 22.17 |
| 2183 | 35.55 | 22.9 | 7.05 | 8.93 | 4.00 | 5 56 | 32.21 |
| 2358 | 41 40 | 27.6 | 7.06 | 9.54 | 4.00 | 6.32 | 32.81 |
| 3106 | 41 02 | 34.4 | 7.32 | 10.02 | 3 80 | 7.66 | 28.19 |
| 3279 | 40 18 | 26.9 | 7.31 | 9.56 | 3.93 | 6.94 | 31.80 |
| 3544 | 37.15 | 31.0 | 6.76 | 8.76 | 3.93 | 5.91 | 36.35 |
| 3594 | 40.00 | 23.8 | 6.98 | 9.33 | 3.96 | 5.55 | 27.53 |
| 3646 | 38.63 | 27.7 | 6.80 | 9.34 | 4.00 | 6.21 | 32.73 |
| 3854 | 37 28 | 25.8 | 6.97 | 9.25 | 4.00 | 7.06 | 30.46 |
| 4048 | 39.75 | 20.7 | 7.02 | 9.25 | 4.06 | 5.66 | 30 65 |
| Pak 22 (Control) | 41.18 | 27.6 | 7 24 | 9.74 | 3.86 | 8.69 | 23.95 |
| 6601 (Control) | 41.18 | 31.5 | 7.28 | 9.88 | 4.00 | 7 86 | 27.08 |

## Results and Discussion

Mung bean cultivars grown by the farmers are indeterminate and irregular in maturity. A change in the plant type through induced mutation generally results in pleiotropic effect on yield and components of yield in various field crops (Gottschalk, 1976). The mutant lines used in this study possessed improvement in various plant characters viz, growth habit, plant height, harvest index, maturity (Table 1) and were generally devoid of profused branching.

The correlation coefficients among the various characters obtained from mutants of mung bean are presented in Table 2. Number of pods per plant (r = 0.6490), length of pod (r = 0.3746) and number of grains per pod (r = 0.4867) showed positive correlation with yield per plant. The correlation between length of pod and number of grains per pod was high (r = 0.6863) while no correlation was found between number of pods per plant and pod length, and number of pods per plant and number of grains per pod. The protein percentage showed negative correlation between number of grains per pod (r = 0.4251) while the correlation between protein percentage and 100 grain weight was positive (r = 0.3825).

**TABLE 2. Correlation coefficients among yield components obtained from induced mutants of mung bean.**

| | Number of pods per plant. | Pod length | Number of grains per pod | 100 grain weight | Grain yield per plant | Protein percentage |
|---|---|---|---|---|---|---|
| Plant height | 0.3689* | 0.1457 | 0.3364 | 0.0108 | 0.4313* | –0.1322 |
| Number of pods per plant | | 0.1576 | 0.2298 | 0.2325 | 0.6490** | –0.3602 |
| Pod length | | | 0.6863** | –0.2847 | 0.3746* | –0.1368 |
| Number of grains per pod | | | | –0.3556 | 0.4867* | - 0.4251* |
| 100 grain weight | | | | | –0.2763 | 0.3825* |
| Grain yield per plant | | | | | | -0:3621* |

*Significant at 5% level
**Significant at 1% level

The previous studies on correlation between various morphological characters and the yield components in several grain legumes mainly showed that grain yield has strong positive correlations with pod number and number of seed per pod (Sing & Malhotra 1970: Tomer *et al.* 1972), but plant height or the number of branches often have little influence on yield and the number of pods per plant. Number of seed per pod and the grain weight usually have a negative correlations among themselves (Gupta & Singh 1969; Bliss *et al.* 1973; Adams, 1972; Aryteetey & Laing, 1973; Durate & Adams, 1972).

Number of pods (r = 0.3689) and yield per plant (r = 0.4313) were positively correlated with plant height. The correlation between plant height and grain yield showed a departure from the previous findings where most of the workers found little correlation between these two parameters. Multiple correlation coefficient computed keeping yield as constant and three component characters viz. plant height, pods per plant and number of grains per pod as variable, indicated that these three components of yield have 56 percent combined effect towards total grain yield production.

Most of the mutant lines exhibited improvement in some yield compoents as well as in harvest index over the parent. The advantage in yield shown by the mutant lines may primarily be due to the efficient partitioning and use of the photosynthates for the development of grains in the determinate and short statured mutant lines.

In the present studies the plant height showed a positive correlation with yield, so in a mutation breeding programme, while selecting for short-statured determinate type plants an equal emphasis should be laid on various yield components having no ill effect on yield.

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