INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2006/08–6–793–795
http://www.fspublishers.org

# Genetic Divergence, Association and Performance Evaluation of Different Genotypes of Mungbean (*Vigna radiata*)

MUHAMMAD SIDDIQUE, M. FAISAL ANWAR MALIK AND SHAHID IQBAL AWAN[1]
*Barani Agricultural Research Station, Fateh Jang-Pakistan*
[1]Corresponding author's e mail: shahid1857@yahoo.com

## ABSTRACT

Eight genotypes of mungbean were utilized to compare their performance, genetic divergence and association among various yield related traits. Analysis of variance indicated highly significant differences for all the traits except grains per pod, which showed non-significant results. The data indicated minimum days to maturity (66) for genotype 01CMG 513, while genotype 01CMG 518 showed maximum days to maturity (76). Highest grain yield (859.26 kg/ha) was recorded for NM-98. The genotypic variance was found highest for grain yield followed by 1000-grain weight. Highest value of heritability was recorded for grain yield (99.81%) followed by 1000-grain weight (92.18%), days to flowering (89.06%) and days to maturity (88.50%). Grain yield (11765.58) and 1000-grain weight (1568.54) showed maximum genetic advance followed by days to flowering (1162.29) and days to maturity (655.03). Positive and significant correlation was exhibited by most of the traits.

**Key Words:** Mungbean; Genotypes; Variability; Heritability; Correlation; Yield performance

## INTRODUCTION

Mungbean (*Vigna radiata*) is a warm season annual pulse grown mostly as an opportunity crop in rotation with cereals. It is grown almost all over the country and has the potential to make up the gap of protein shortage. But yield per acre in the country is still marginal. For any yield improvement programme selection of superior parents is an essential prerequisite i.e. possessing better heritability and genetic advance for various traits (Khan *et al*., 2005). The knowledge of genetic variability existing within the different parameters contributing to yield is also an important criterion for yield enhancement but in highly self-pollinated crops like mungbeans natural variation is narrow resulting in limited selection opportunity. The efficacy of selection depends upon the magnitude of genetic variability for yield and yield contributing traits in the breeding material. The knowledge of heritability and genetic advance guides the breeders to select superior parents to initiate an effective and fruitful crossing programme. Correlation analysis provides the information of interrelationship of important plant characters and hence, leads to a directional model for direct and/or indirect improvement in grain yield (Khan *et al*., 2004). Acharya *et al.* (1993) reported that phenotypic and genotypic coefficients of variation were high for pods per plant and yield per plant. Khan *et al.* (2004) indicated highly significant genetic differences among genotypes for days to 50% flowering, yield and yield related traits. Similarly, Celal (2004) pointed out positive and statistically significant relationships between seed yield per plant and days to flowering, pods per plant, seeds per plant, harvest index and 1000-seed weight. Imrie and Butler (2005) stated that the estimated variance due to environment exceeded than that due to genotypes for all characters. Current studies were conducted with two main objectives in mind. First, to estimate the genetic variability, heritability and association among yield and related traits in mungbean. Second performance evaluation of different genotypes of mungbean under rainfed conditions for the selection of better parents to initiate a breeding programme.

## MATERIALS AND METHODS

An experiment was performed to compare the performance and to estimate the genetic variability, heritability and association among yield and related traits in mungbean genotypes at Barani Agricultural Research Station, Fatehjang during the year 2005. Eight genotypes (including NM-98 as check) were sown in a plot size of 5 m x 1.8 m using triplicated Randomized Complete Block Design maintaining row-to-row distance of 30 cm. The experiment was sown on 26-06-05 and harvested on 13-09-05. All the cultural practices were uniformly applied to all the experimental units to minimize the experimental error. Data were recoded for days to flowering, days to maturity, pods per plant, grains per pod, 1000-grain weight and grain yield (kg/ha) from 10 well guarded and randomly selected plants. The means were subjected to analysis of variance by the standard method of Steel and Torrie (1984). Genetic components of variance were obtained as outlined by Johnson *et al*. (1956) and Mahmud and Kramer (1951). Heritability estimates were calculated using procedures given by Allard (1960). Phenotypic correlation coefficients were worked out between the traits following Snedecor (1956).

## RESULTS AND DISCUSSION

Analysis of variance indicated highly significant differences for all the traits except grains per pod, which showed non-significant results (Table I). The data from Table II indicated minimum days to flowering (46) and days to maturity (66) for genotype 01CMG 513, while genotype 01CMG 518 showed maximum days to flowering (65) and days to maturity (76). Data regarding pods per plant showed minimum pods per plant (11.89) for the genotype 01CMG511, while genotype 01CMG512 showed maximum pods per plant (34.44). Maximum grains per pod (8.91) were recorded for genotype 01CMG511, while minimum (7.51) were found in 01CMG517. 1000-grain weight was highest in 01CMG511 (56.16), while it was recorded lowest in 01CMG 518 (34.74). Highest grain yield (859.26 kg/ha) was recorded in NM-98, while genotype 01CMG516 gave the lowest grain yield (681.48 kg/ha).

The estimates of genetic variances were smaller than their respective phenotypic variance for all the traits evaluated (Table III). Similarly, estimates of genetic variance were greater than that of environmental variances for all the traits. The genotypic variance was found highest for grain yield followed by 1000-grain weight indicating the greater magnitude of genetic variability for these traits. All the traits under study were highly heritable except pods per plant. Maximum value of heritability was recorded for grain yield (99.81%) followed by 1000-grain weight (92.18%), days to flowering (89.06%) and days to maturity (88.50%). These traits were expected to remain stable under varied environmental conditions, as environment is less influential on highly heritable traits and could easily be improved by applying selection pressure. Pods per plant (9.12%) showed lowest heritability. Grain yield (11765.58) and 1000-grain weight (1568.54) showed maximum genetic advance followed by days to flowering (1162.29) and days to maturity (655.03). High heritability and high genetic advance was an indication that these traits were controlled by additive genes. The coefficient of variation (C.V. %) is a good basis for comparing the extent of variation between different characters with different scales. The C.V. % was found maximum for days to maturity (8.71%).

The simple correlation coefficient (Table IV) for days to flowering showed positive and significant correlation with days to maturity, pods per plant and grain per pod, whereas it was negatively and significantly correlated with 1000-grain weight and grain yield. Days to maturity indicated positive and significant correlation with pods per plant, grains per pod and grain yield, while 1000-grain weight was negatively and significantly correlated with it. Pods per plant, was negatively and significantly correlated with grains per pod, 1000-grain weight and grain yield. Grains per pod exhibited positive and significant correlation with 1000-grain weight and grain yield, while 1000-grain weight was positively and significantly correlated with grain yield. These results are in close agreement with the findings of Acharya *et al.* (1993), Khan *et al.* (2004), Celal (2004) and Imrie and Butler (2005).

It is obvious from the above discussion that the

**Table I. Mean squares studied in eight different genotypes of mungbean**

| SOV | d. f. | Days to Flowering | Days to Maturity | Pods/Plant | Grains/Pod | 1000-grain wt | Grain Yield |
|---|---|---|---|---|---|---|---|
| Blocks | 2 | 4.67** | 11.29** | 135.82** | $1.82^{NS}$ | $1.18^{NS}$ | 3120.50** |
| Genotypes | 7 | 111.31** | 35.66** | 127.21** | $0.65^{NS}$ | 193.45** | 9782.57** |
| Error | 14 | 4.38 | 1.48 | 97.77 | 0.11 | 5.32 | 6.21 |

**Table II. Mean values in different genotypes of mungbean**

| Sr No | Genotyppes | Days to Flowering | Days to Maturity | Pods/Plant | Grains/Pod | 1000-grain wt | Grain Yield |
|---|---|---|---|---|---|---|---|
| 1 | 01CMG511 | 49 | 70 | 11.89 | 8.91 | 56.16 | 775.93 |
| 2 | 01CMG512 | 49 | 68 | 34.44 | 8.02 | 49.31 | 722.22 |
| 3 | 01CMG513 | 46 | 66 | 22.17 | 8.37 | 54.42 | 811.11 |
| 4 | 01CMG514 | 48 | 70 | 23.78 | 7.94 | 54.40 | 748.15 |
| 5 | 01CMG516 | 53 | 72 | 28.50 | 8.48 | 39.48 | 681.48 |
| 6 | 01CMG517 | 54 | 73 | 20.11 | 7.51 | 40.84 | 759.26 |
| 7 | 01CMG518 | 65 | 76 | 25.59 | 8.44 | 34.74 | 711.11 |
| 8 | NM-98 (Check) | 57 | 75 | 24.15 | 8.80 | 49.98 | 859.26 |
| | Grand Mean | 52.63 | 71.25 | 23.83 | 8.31 | 47.42 | 758.57 |

**Table III. Genotypic variance (δg), phenotypic variance (δp), environmental variance (δe), broad sense heritability ($h^2$), genetic advance (GA) and coefficient of variation (CV%) for mung bean genotypes**

| SOV | Days to Flowering | Days to Maturity | Pods/Plant | Grains/ Pod | 1000-grain wt | Grain Yield |
|---|---|---|---|---|---|---|
| δg | 35.64 | 11.39 | 9.81 | 0.18 | 62.71 | 3258.79 |
| δp | 40.02 | 12.88 | 107.58 | 0.29 | 68.03 | 3264.99 |
| δe | 4.38 | 1.48 | 97.77 | 0.11 | 5.32 | 6.21 |
| $h^2$(bs)% | 89.06 | 88.50 | 9.12 | 62.07 | 92.18 | 99.81 |
| GA | 1162.29 | 655.03 | 195.20 | 68.51 | 1568.54 | 11765.58 |
| CV% | 6.99 | 8.71 | 11.50 | 4.00 | 7.86 | 8.33 |

**Table IV. Simple correlation coefficients for yield and yield related traits of mungbean genotypes**

| | Days to Flowering | Days to Maturity | Pods/Plant | Grains/Pod | 1000-grain wt |
|---|---|---|---|---|---|
| Days to Maturity | 0.861* | | | | |
| Pods/Plant | 0.066* | 0.180* | | | |
| Grains/ Pod | 0.121* | 0.288* | -0.033* | | |
| 1000-grain wt | -0.760* | -0.637* | -0.208* | 0.139* | |
| Grain Yield | -0.164* | 0.002* | -0.200* | 0.376* | 0.550* |

average performance of genotypes could not exceed that of check variety (NM-98). The genotype 01CMG 513 not only showed some promise to induce earliness but was also potentially good for traits as 1000-grain weight and grain yield. Moreover, high heritability and genetic advance linked to these traits is an indication that they can easily be transferred to succeeding generations and will remain stable under different ecoenvironments. The genotypes as a whole showed plenty of genetic variability to be exploited in a breeding programme. Strong correlation among days to flowering and days to maturity, 1000-grain weight and grain yield will lead towards direct or indirect improvement for earliness and grain yield.

## REFERENCES

Acharya, S., S.K. Gupta and B.S. Jamwal, 1993. Evolution of local germplasm of urdbeans from Jammu. *Indian J. Pulses Res*., 6: 198–9

Allard, R.M., 1960. *Principles of Plant Breeding*. John Willey and Sons, Inc., USA

Celal, Y., 2004. Correlation and path coefficient analysis of seed yield components in the narbon bean (*Vicia narbonensis* L.). *Turk J. Agric*., 28: 371–6

Imrie, B.C. and K.L. Butler, 2005. An analysis of variability and genotype × environment interaction in mungbean (*Vigna radiata*) in south-eastern Queensland. *Australian J. Agric. Res*., 33: 523–30

Johnson, H.W., H.F. Rodinson and R.E. Cronstrock, 1956. Estimation of genetic and environment variability in soybeans. *Agron. J*., 47: 314–8

Khan, M.D., I.H. Khalil, M.A. Khan and Ikramullah, 2004. Genetic divergence and association for yield and related traits in mash bean. *Sarhad J. Agric*., 20: 555–61

Khan, M.Q., S.I. Awan and M.M. Mughal, 2005. Estimation of genetic parameters in spring wheat genotypes under rainfed conditions. *Indus J. Biol. Sci*., 2: 367–70

Mahmud, I. and H.H. Kramer, 1951. Segregation for yield, height and maturity following a soybean cross. *Agron. J.,* 43: 605–9

Snedecor, G.W., 1956. *Statistical Methods, 5th Ed.* Iowa State University Press, Ames, Iowa, U.S.A

Steel, R.G.D. and J.H. Torrie, 1984. *Principles and Procedures of Statistics: A Biometrical Approach*. McGraw Hill Book Co., Inc., New York, USA

**(Received 25 April 2006; Accepted 20 September 2006)**