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EVALUATION OF MUNGBEAN GERMPLASM AND SELECTION OF PARENTS FOR GENETIC STUDIES

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Fifty-five lines of mungbean were evaluated for their days to maturity and grain yield. Maturity duration of the lines studied ranged from 63-91 days. The line NM-92 was the earliest maturing and 562-1 was the most late maturing. Grain yield per plant ranged from 3.29 to 11.70 g. Minimum yield was produced by line NM-95 and the line 96006 produced maximum yield. Scatter diagram was plotted taking grain yield along X axis and maturity duration on Y axis. Eight lines viz. 562-1, 56-2, NM-95, NM-92, L. No. 1, L. No. 21, 6601 and E 32-1 belonging to different maturity duration and grain yield regimes were selected on the basis of their position on the scattered diagram.

INTRODUCTION

Mungbean (*Vigna radiata* (L.) Wilczek) is cultivated on 239.2 thousand hectares giving 482 kg ha^{-1} grains (1). Although mungbean production in the country has increased tremendously during the past two decades but the average yield remained more or less static. This increase in production is ascribed to the increase in area (Table-5) which expanded due to development and adaptation of early and uniform maturing genotypes but their yield potential was at par to the pre-existing cultivars.

Tickoo *et al.* (1988) studied 548 accessions of mungbean germplasm and reported that the range for days to flowering and days to maturity was 31 to 88.6 and 56 to 135.7, respectively with a mean of 45 and 73. Plant height varied from 12.8 to 102.1 cm. Grain yield per plant ranged from 2.00 to 28.2 g. Seeds per pod varied from 4.9 to 18.4 and 1000-seed weight varied from 15.9 to 98.7 g. Byregowda *et al.* (1997) reported higher genetic variability for grain yield in mungbean. Chakraborty and Haque (1999) observed wide variation for number of pods per plant, seed yield per plant, 1000 grain weight and plant height. A high degree of positive association was observed for seed yield per plant with 100 grain weight, number of pods per plant and plant height at both genotypic and phenotypic levels. Days to 50% flowering, length of reproductive phase, 100 grain weight and number of pods per plant showed a positive direct effect on seed yield in that order whereas, days to maturity had a negative direct effect on yield. Ghaviami and Rezai (2000) conducted a field experiment and reported the presence of high genetic variability for yield and other yield components in 193 accessions of mungbean.

The present studies were conducted to ascertain the amount of genetic variability in mungbean germplasm for earliness and grain yield and selection of suitable parents for hybridization program.

MATERIALS AND METHODS

Fifty five diverse mungbean lines developed by the University of Agriculture, Faisalabad; Pulses Research Institute, Faisalabad and Nuclear Institute for Agriculture and Biology, Faisalabad were planted in the field during spring 2002. The experiment was planted in a randomized complete block design replicated thrice. Inter and intra row spacing were maintained as 30 and 10 cm, respectively. Each genotype comprised a single row of 3m length thus accommodating 31 plants. At maturity data regarding days taken to maturity and grain yield per plant were recorded. Days taken to maturity were counted from sowing to maturation of 90% pods in each entry. Data for grain yield per plant was recorded from 10 equally competent plants in each entry. The data was subjected to analysis of variance using MSTAT-C (version 1.3) computer programme.

RESULTS AND DISCUSSION

Fifty five genotypes of mungbean evaluated for days taken to maturity and yield per plant are given in Table-1.

Days to Maturity

The 55 lines of mungbean were significantly different for their days to maturity (Table 2) Days to maturity ranged from 63 to 91 days with a mean value of 76.55 (Table 4). Minimum days were taken by NM-92 (63 days) followed by L. No. 23 and E 22-2 (69 days each) to mature. Maximum number of days were taken by 562-1(91 days) followed by 56-2 (88 days). Coefficient of variation observed for the trait was 1.78(Table-4).

Table 1. Number of days taken to maturity and grain yield per plant of mungbean accessions evaluated during spring (2002)

Sr. #	Lines/varieties	Days to maturity	Grain yield (g)	Sr. #	Lines/varieties	Days to maturity	Grain yield (g)
1	NM-51	72.00	5.54	29	97012	80.33	10.05
2	NM-54	79.33	5.99	30	97015	79.70	3.76
3	NM-89	80.00	4.41	31	97016	77.66	10.00
4	NM-92	63.00	9.77	32	97018	80.33	10.63
5	NM-95	70.33	3.29	33	97019	76.67	7.80
6	NM-98	75.66	10.83	34	98008	80.00	7.41
7	AUM-9	76.00	3.53	35	L. No. 1	75.33	7.40
8	AUM-13	75.66	7.22	36	L. No. 2	78.33	10.01
9	AUM-18	77.00	5.61	37	L. No. 9	80.00	9.22
10	AUM-19	78.66	4.20	38	L. No. 21	78.00	11.48
11	AUM-27	78.66	4.11	39	L. No. 23	69.00	6.38
12	AUM-28	79.00	7.22	40	L. No. 25	72.33	7.57
13	AUM-29	78.33	4.40	41	L. No. 32	74.33	8.13
14	AUM-31	77.33	5.27	42	L. No. 71	74.66	7.51
15	AUM-38	78.00	8.41	43	L. No. 74	72.33	7.90
16	6375	76.00	4.41	44	L. No. 103	72.66	8.53
17	56-2	88.33	6.33	45	L. No. 113	74.66	9.07
18	562-1	91.00	9.21	46	L. No. 122	74.66	8.72
19	96002	77.00	11.70	47	L. No. 158	74.66	7.61
20	96005	76.67	9.93	48	E22-2	69.00	7.71
21	96008	79.00	10.32	49	E32-1	75.00	9.87
22	96010	76.00	8.39	50	E44-2	77.00	8.10
23	96011	76.00	10.39	51	E101-1	75.33	8.03
24	96012	78.66	10.72	52	E195-1	75.33	8.45
25	96014	78.00	8.51	53	RC-68	73.00	8.85
26	97006	80.33	9.52	54	M20-21	70.33	5.54
27	97008	76.33	10.65	55	6601	82.00	5.28
28	970011	76.66	7.89				

Frequency distribution for days to maturity is presented in Fig. 1 as histogram. This depicts that maximum number of genotypes (33) took 75-80 days to mature. Thirteen genotypes matured in 70-75 days while 4 genotypes took 80-85 days to mature and two matured in 65-70 days, only one genotype fell in 85-90 days group. Similarly one genotype fell in the each categories taking less than 65 days and taking more than ninety days. Forty six genotypes (83%) took 70-80 days to mature. Tickoo *et al.* (1988) reported a considerable range of variability (56-135.7 days) for the trait in mungbean.

Table 2. Analysis of variance for days to maturity in the mungbean genotypes

S.O.V.	d.f.	S.S.	M.S.	F. Value
Replication	2	121.79	60.89	32.63**
Genotype	54	3041.48	56.32	30.18**
Error	108	201.54	1.86	

** = P < 0.01

Grain Yield Per Plant

Table 3 depicted highly significant differences for grain yield per plant. The range for grain yield observed in the lines under study was 3.29-11.70 g per plant with a mean of 7.79 (Table 4). Maximum grain yield of 11.70 g recorded for 96002 was followed by L. No. 21 producing 11.48 g grains per plant. Minimum yield of 3.29 g produced by NM-95 was followed 3.53 g grains per plant in AUM 9. The coefficient of variability observed for the trait was 6.71(Table-4).

Table 3. Analysis of variance for grain yield per plant in the mungbean genotypes

S.O.V.	d.f.	S.S.	M.S.	F. Value
Replication	2	12.83	6.41	23.50**
Genotype	54	794.61	14.71	53.90**
Error	108	28.82	0.26	

** = P < 0.01

Table 4. Range, mean and coefficient of variability for the mungbean genotypes evaluated during spring 2002.

Character	Minimum	Maximum	Mean	CV (%)
Days to maturity	63	91	76.55	1.78
Grain yield per plant(g)	3.29	11.70	7.79	6.71

Table 5. Area production and yield of mungbean in Pakistan.

Year	Area 000 ha	Production 000 tones	Yield kg/ha
1980-81[1]	67.0	31.8	475
1980-85[1]	79.2	37.3	471
1985-90[1]	110.6	49.1	444
1990-95[1]	152.4	63.8	419
1995-00[1]	197.8	90.8	459
2000-01[1]	219.2	104.5	477
2001-02[2]	239.2	15.4	482

Source: 1. Agri. Statistics of Pakistan,2001-02
2. Statistical Year Book, 2003

Frequency distribution for grain yield per plant is presented in Fig 2 which revealed that maximum genotypes i.e. 11 fall in the category yielding 7-8 g and 10 lines yielded 8-9 g grains per plant while 8 each gave 9-10 and 10-11 g yield per plant. In other words 67% (37 genotypes) ranged in yield from 7-11 g per plant, 3 genotypes had the lowest extreme (i.e.) 3-4.8 g while 2 were in the upper limit (i.e.) 11-12 g in the material.

Sufficient variability for grain yield in mungbean has been reported by Tickoo *et al.* (1988), Byregowda *et al.* (1997) Chakraborty and Haque (1999), Ghaviami and Rezai (2000).

Selection of the Parents

Main objective of this study was to select suitable parents which exhibit maximum range of variability in the available germplasm particularly for maturity duration and grain yield. For reliable selection scatter diagram was plotted by taking grain yield per plant along X-axis and days to maturity along Y-axis (Fig 3). It was observed that for maturity duration most of the genotypes scattered in the region belonging to 70-80 days. However, for yield per plant the genotypes differed greatly. A horizontal line drawn from the point representing population mean for maturity duration (76.55 days) on Y axis and a vertical line drawn from the point of mean grain yield per plant (7.79g) on the X axis has divided the scatter diagram field in to four quadrants viz a region representing early maturity low yield, a region for early maturity high yield, a region for late maturity high yield and a region for late maturity low yield combination. Twelve lines were represented in early maturity low yield region, fifteen appeared to be in early maturity high yield region, sixteen were related to late maturity high yield group and twelve showed their relationship with late maturity low yield group. Eight lines/varieties viz. 562-1, 56-2, NM-95, NM-92, L. No. 1, L. No. 21, 6601 and E 32-1 i.e. two from each combination of grain yield and maturity duration were selected for use as a parent in the hybridization programme. It was expected that upon crossing these genotypes, a wider range of recombinants would be available for earliness and yield related characters which will be used to record data in F_1 and F_2 generations that will be analyzed to see the inheritance pattern and inter-association of some useful traits in mungbean.

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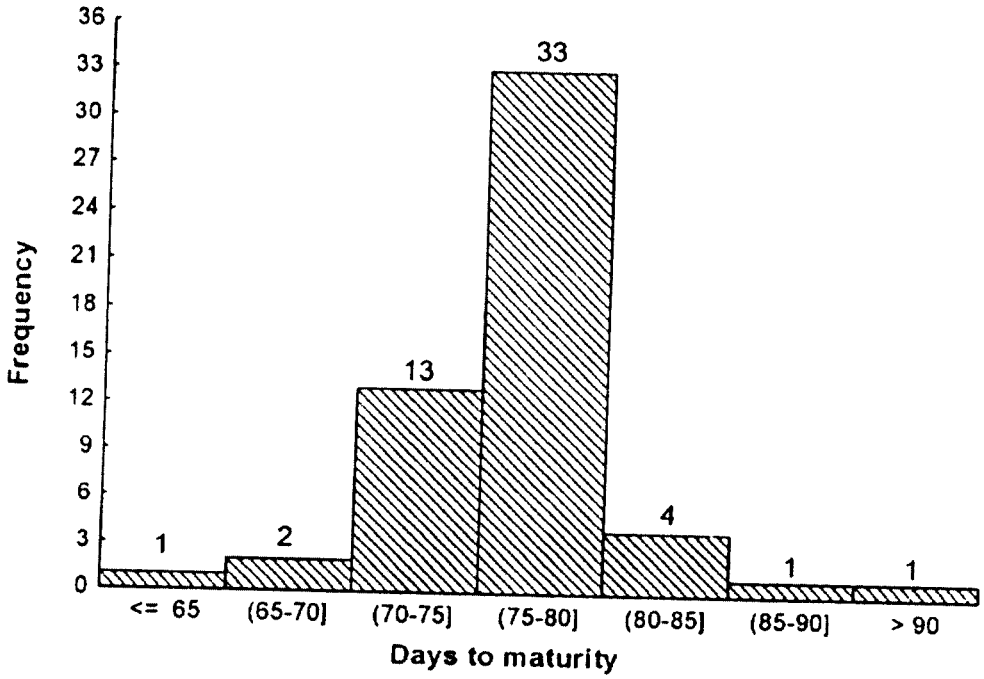

Fig. 1. Frequency distribution for days to maturity

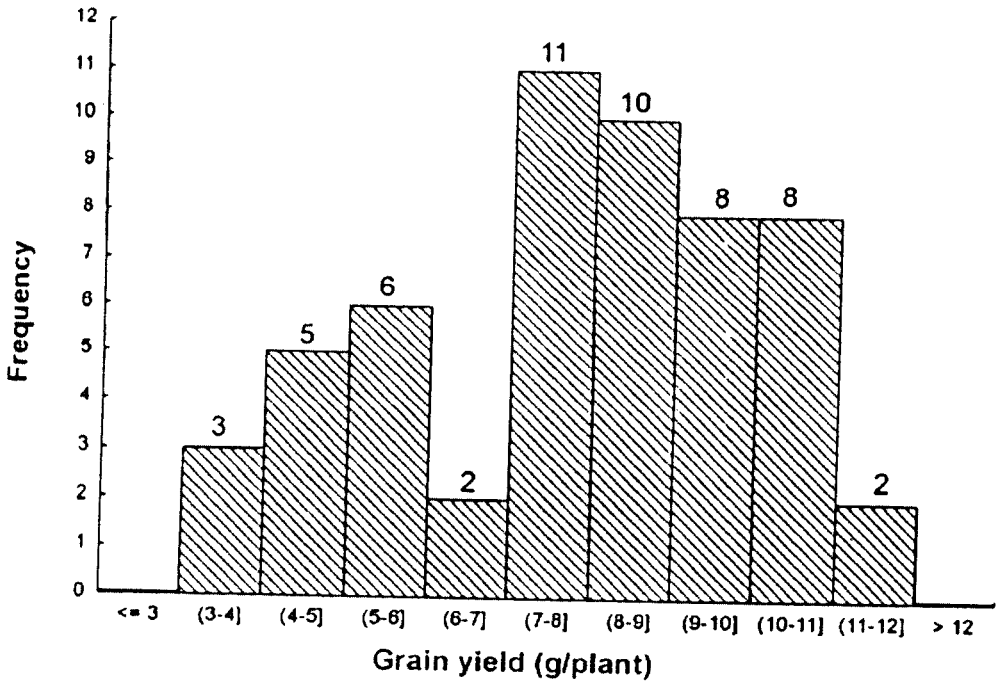

Fig. 2. Frequency distribution for grain yield per plant (g)

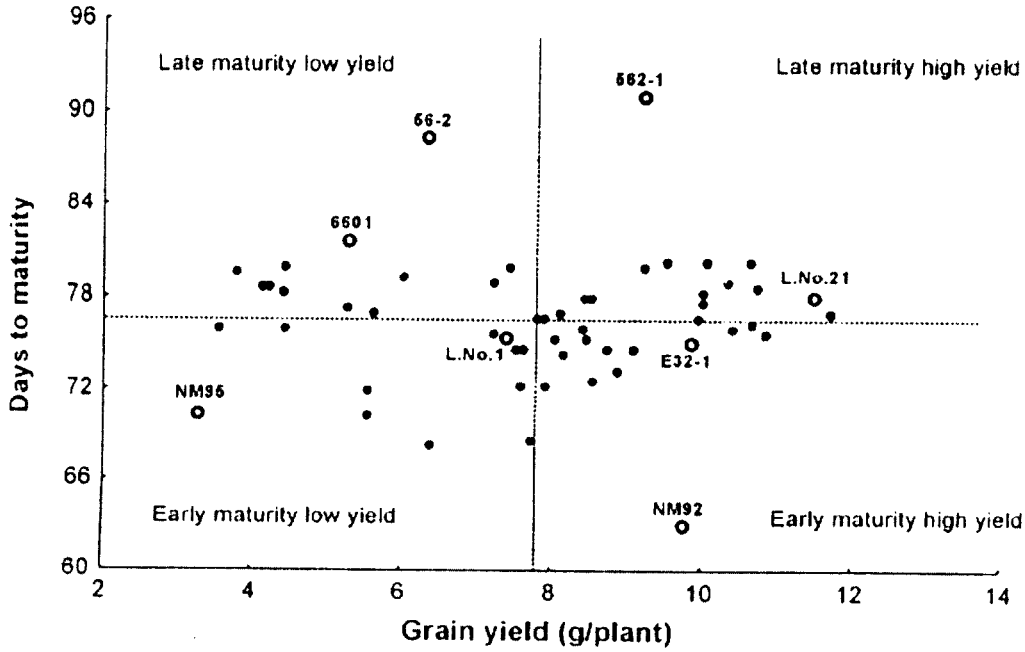

Fig. 3. Scatter diagram of days to maturity and grain yield per plant (g)