

## STUDY ON SEED QUALITY AND PERFORMANCE OF SOME MUNGBEAN VARIETIES IN BANGLADESH

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### ABSTRACT

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The experiment was conducted at Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh during the period of March to June 2008 to assess the seed quality and performance of some mungbean varieties. In the experiment, a total of eight mungbean seed samples belonging eight varieties viz. BINA moog-5, BARI mung-3, BARI mung-4, BARI mung-5, BARI mung-6, BU mug-1, BU mug-2 and BU mug-4 were used for laboratory test. Purity percentage and germination percentage of the seeds of all varieties were higher than the national seed standard. The minimum purity was 99.35%, germination was 88.33% and moisture content of all seed samples was lower than the acceptable seed standard. The minimum moisture content of seed samples was 9.22% and the highest 9.92%. The highest 1000 seed weight differed from 28.93 to 52.98 g among the mungbean varieties. In seed health test, nine species of fungi under six genera were recorded from mungbean seed samples. They were *Alternaria brassicicola*, *A. brassicae*, *Aspergillus flavus*, *A. niger*, *Ascochyta rabiei*, *Fusarium* sp, *Macrophomina phaseolina* and *Rhizopus* sp. Among them *Aspergillus* spp (*A. flavus* and *A. niger*) were the most predominant fungi which was followed by *Fusarium* sp.

**Key words:** seed quality, performance, mungbean variety, mycoflora

### INTRODUCTION

Mungbean (*Vigna radiata* (L.) Wilczek) is an important wide spreading, herbaceous, annual, self-pollinated legume pulse crop under the family Leguminosae. In Bangladesh, among pulses, mungbean ranks fourth in acreage, third in production and first in market price (BBS, 2006). It can fix atmospheric nitrogen through symbiotic relationship with rhizobium bacteria and improves the soil fertility (Yadav *et al.* 1994). It is an excellent source of proteins and minerals for most of the peoples of Bangladesh. Mungbean has been considered as a “poor men’s protein” (Mian 1976). Apart from 26% protein, it also contains 51% carbohydrate, 10% moisture, 4% minerals and 3% vitamins (Khan 1981). The average yield of mungbean is very low (763.50 kg<sup>ha</sup>) as compared to its potential yield of 2 to 4 ton<sup>ha</sup> (Ramakrishna *et al.* 2000). There are various factors which are responsible for low yield of mungbean in our country of which use of poor quality seed and disease infestation in the field are the most important (Bakr and Rahman, 1998). Poor seed quality like low germination capacity affects the yield of mungbean. Seeds with low germination capacity may capable to emergence to some degree but healthy plants can not be ensured. Purity percentage and moisture content of seed also affect on yield of mungbean. Impure seeds create many hazards in the field like suboptimal crop population and enhancement of weed infestation. Similarly, seed moisture content above safe life is highly dangerous as it is accelerates the death of seed at much high rate than that of other factors related to seed deterioration. Seeds are common carrier of plant pathogens, which act as the primary source of inocula of many diseases (Rahman and Mia, 1998). Contaminated seeds can often result in poor germination and poor seedling vigor, resulting in an un-healthy crop. Healthy seed is the foundation of healthy plant; a necessary condition for good yields (Diaz *et al.* 1998). Field fungus associated with seeds cause deterioration of seed quality, affect viability and reduces germination (Srivastava and Gupta, 1981). The infected seeds fail to germinate or seedlings and plants developed in the field from infected seeds may escape early infection but may often be infected at the later stage of growth. Besides, pathogens can spread over a long distance and uninfected field may be infected by the seeds in which different pathogens are present (Fakir *et al.* 2001). A large number of mycoflora was reported to be associated with the mungbean seeds. *Alternaria* sp, *Fusarium oxysporum*, *Fusarium solani*, *Fusarium equiseti*, *Myrothecium roridum*, *Drechslera* spp, *Aspergillus flavus*, *A. niger* and *Macrophomina phaseolina* were found in germinating seed and seedling of mungbean (Bakr and Rahaman, 2001). At present, fifteen mungbean varieties are available in Bangladesh. However, information relating seed quality and performance of those varieties is not well documented. Therefore the study was thus undertaken to evaluate the quality status of seeds of different mungbean varieties commonly available in Bangladesh.

### MATERIALS AND METHODS

The experiment was conducted at Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh during the period of March to June 2008. The seeds of eight varieties of mungbean (BARI mung-3, BARI mung-4, BARI mung-5, BARI mung-6, BU mug-1, BU mug-2, BU mug-4 and BINA moog-5) were collected

during 2007-2008 from Bangladesh Agricultural Research Institute, Gazipur (BARI); Bangabandhu Sheikh Mujibur Rahaman Agricultural University, Gazipur (BSMRAU) and Bangladesh Institute of Nuclear Agriculture, Mymensingh (BINA) to assess the quality status of seeds. One kilogram seeds of each variety was collected and kept in air tight polyethylene bag. They were brought to the laboratory of plant pathology, and preserved in a refrigerator at 4°C. Quality attributes and health status of the seeds were determined by taking samples from each variety of the seeds. For quality tests such as purity test, moisture test, germination test, 1000-seed weight and health status were studied. Working samples were drawn from individual sub samples at the time of each test.

#### **Purity test**

After mixing 2-3 times, 400 g of mungbean seed was taken from each variety for purity test. These working samples were separated into three components such as pure seed, other seed and inert matter.

#### **Moisture content**

Moisture content was determined by oven dry method following low constant temperature oven method (ISTA 2006 a). Three independent working samples of seeds were drawn from each sub samples. Five grams of seed of each working sample were dried in an oven at 103±2°C for seventeen hours. Percentage of moisture content was calculated using following formula:

$$\% \text{ Moisture Content} = \frac{M_2 - M_3}{M_2 - M_1} \times 100$$

Where,

M<sub>1</sub> = Weight in grams of the container and its cover,

M<sub>2</sub> = Weight in grams of the container, its cover and mungbean seed before drying, and

M<sub>3</sub> = Weight in grams of the container, cover and mungbean seed after drying.

#### **Thousand seeds weight**

To determine 1000 seeds weight, sub samples were drawn from each seed samples. A total of 3000 pure seeds were sorted out. They were divided into three working samples. Weight of 1000 seeds was measured taking 100 seeds at a time. Average weight of three working samples were computed and recorded as 1000-seed weight (Ariyaratne 1998).

#### **Germination test**

Four (4) hundred pure seeds were randomly taken from each sample for germination test. Three layered moistened blotting paper was taken on germination containers. Hundred (100) seeds were placed on each container and kept at 25°C temperature. First count and final count were taken at 5 days and 8 days, respectively. Only the normal seedlings were counted for germination percentage. Mungbean seed species is belonged to the seedling evaluation group 2.1.2.2 (ISTA 2006b). It is dicotyledon with epigeal germination, elongated epicotyl and secondary roots are taken into account if primary roots are defective.

#### **Vigor index**

Vigor index (VI) was calculated (Anon. 1983) according to the following formula:

$$VI = \frac{\text{No. of germinated seeds at first count}}{\text{Days of first count}} + \frac{\text{No. of germinated seeds at final count}}{\text{Days of final count}}$$

#### **Mean germination time**

Mean germination time (MGI) was calculated according to the equation of Ellis and Roberts (1981):

$$MGI = \frac{\sum Dn}{\sum n}$$

Where *n* is the number of seeds germinated on day *D* and *D* is the number of days counted from the beginning of germination.

#### **Seed health test**

Health status of seeds was determined by blotter method (ISTA 1966). A working sample of 400 seeds was randomly drawn from each sample. The seeds were placed on three layered moistened blotter paper in glass petridish (9 cm) at the rate of 25 seeds per petridish. The petridishes were incubated at 25±2°C under natural light

and darkness cycle for seven days. Different fungi grown on the incubated seeds were recorded by using stereo binocular microscope following standard keys. In case of confusion, temporary mounts were prepared and examined under compound microscope for identification of the associated fungi. Prevalence of fungi was expressed in percentage based on total number of seeds plated. Data were analyzed statistically by using MSTAT-C software for proper interpretation. The mean values were compared according to Duncan Multiple Range Test (DMRT) at 5% level of significance.

## RESULTS AND DISCUSSION

Results of the quality tests of mungbean varieties seed collected from Bangladesh Agricultural Research Institute (BARI) Gazipur, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur and Bangladesh Institute of Nuclear Agriculture (BINA), Mymensing are presented below.

### Purity

Among eight seeds samples, the range of purity was 99.35% to 99.94%. All the samples had higher purity percentage than the recommended standard (95%) of National Seed Board (NSB) of Bangladesh (Table 1). The highest average purity percent of 99.94% was obtained from BARI mung-6 followed by BU mug-4 (99.90%), BARI mung-3 (99.73%), BU mug-2 (99.70%), BARI mung-5 (99.66%), BINA moog-5 (99.49%), BU mug-1 (99.42%). BARI mung-4 gave the lowest purity (99.35%).

### Moisture content

Moisture content of seed samples of different varieties differed significantly. The highest moisture content (9.92%) was recorded in BARI mung-4 which was statistically identical with BARI mung-3 (9.90%), BINA moog-5 (9.69%), BARI mung-5 (9.45%), BU mug-4 (9.40%) and BU mug-2 (9.37%). Significantly the lowest moisture content was recorded from BARI Mung-6 (9.22%) which was followed by BU Mug-1 (9.24%) (Table1). As per recommendation of NSB moisture content of mungbean seeds should be less than 10.00%. Results of the present investigation showed that moisture content of all the seed samples were lower than the recommended standard.

### Thousand seed weight

1000-seed weight of eight mungbean seed samples, varied from 28.93 to 52.98g (Table 1). Significantly the highest 1000-seed weight of 52.98 g was obtained from BU mug-4 which was followed by BARI mung-6 (44.73g). BARI mung-3 gave significantly the lowest 1000-seed weight (28.93g) which was statistically similar with and BARI mung-4 (30.85g), BU mug-1 (30.97g) and BU mug-2 (31.95g).

Table 1. Quality attributes of eight mungbean varieties seed samples collected from BARI, BINA and BSMRAU

Treatment	Purity (%) <sup>NS</sup>	Moisture content %	1000 seed weight (g)
BINA moog-5	99.49	9.69 ab	40.92 bc
BARI mung-3	99.73	9.90 a	28.93 d
BARI mung-4	99.35	9.92 a	30.85 d
BARI mung-5	99.66	9.45 ab	39.40 c
BARI mung-6	99.94	9.22 b	44.73 ab
BU mug-1	99.42	9.24 b	30.97 d
BU mug-2	99.70	9.37 ab	31.95 d
BU mug-4	99.90	9.40 ab	52.98 a
CV%	1.34	3.04	5.07

Values in a column with same letter(s) are not statistically different at 0.05 level of significance by DMRT

NS indicates not significant

### Germination capacity

The germination percentage of eight seed samples of mungbean varieties varied from 88.33% to 100% (Table 2). Highest germination of 100% was found in BARI mung-6 and BU mug-4 (100%) which were statistically similar with BARI mung-3 (99.33%), BU mug-1 (98.67%), BINA moog-5 (96.33%), BARI mung-5 (95.67%), BU mug-2 (95.00%). The lowest germination percentage was obtained from BARI mung-4 (88.33%). The results reflected that different mungbean varieties seeds saved by different Research Institute and University had the higher germination capacity than the recommended by NSB (80%).

**Vigor index (VI)**

The vigor index of eight seed samples of mungbean varieties varied from 59.28 to 94.22 (Table 2). Significantly the highest vigor index of 94.22 was recorded in BARI mung-6 which was statistically identical with BU mug-4 (87.28). Significantly the lowest vigor index was recorded from BARI mung-4 (59.28) which was statistically similar with BU mug-1 (61.83).

**Mean germination time (MGT)**

The mean germination time studied on mungbean varieties seeds are presented in Table-2 reflected that mean germination time was differed significantly. Significantly the highest mean germination time of 1.97 days was recorded in BARI mung-4. BARI mung-6 gave significantly the lowest mean germination time (1.18 days). Result revealed that different research institute and university preserved the seed samples of different mungbean varieties at optimum storage condition so therefore, seed qualities of the entire seed sample were above the recommended seed standard by NSB.

Table 2. Seed germination%, vigor index (VI) and mean germination time (MGT) of eight mungbean varieties

Treatment	Germination%	Vigor index (VI)	Mean germination time (Day)
BINA moog-5	96.33 a	78.89 bc	1.42 c
BARI mung-3	99.33 a	77.72 c	1.43 c
BARI mung-4	88.33 b	59.28 d	1.97 a
BARI mung-5	95.67 a	79.39 bc	1.38 c
BARI mung-6	100.00 a	94.22 a	1.18 d
BU mug-1	98.67 a	61.83 d	1.72 b
BU mug-2	95.00 a	75.83 c	1.47 c
BU mug-4	100.00 a	87.28 ab	1.26 cd
CV%	3.01	6.42	7.68

Values in a column with same letter(s) are not statistically different at 0.05 level of significance by DMRT

**Seed Health status**

Altogether eight species of fungi under six genera were recorded from eight seed samples of mungbean varieties collected from different Research Institute and University (Table 3). They were *Alternaria* spp. (*A. brassicicola* and *A. brassicae*), *Aspergillus* spp. (*A. flavus* and *A. niger*), *Ascochyta rabiei*, *Fusarium* sp., *Macrophomina phaseolina* and *Rhizopus* sp. Among these fungi *Aspergillus* spp. (*A. flavus* and *A. niger*) was found to be the most prevalent fungi ranging from 10.30% to 27.30% which was followed by *Fusarium* sp. ranging from 11.85% to 15.45%. The highest *Aspergillus* spp. were found in BARI mung-4 (27.30%), followed by BU mug-2 (14.94%), BINA moog-5 (14.42%) and BARI mung-3 (14.42%). The lowest *Aspergillus* spp. was found in BARI mung-6 (10.30%). In case of *Fusarium* sp. the highest *Fusarium* sp. were found in BARI mung-4 (15.45%) which was statistically similar with BARI mung-3 (15.45%), BINA moog-5 (14.94%), BU mug-2 (14.94%) and BU mug-1 (14.42%). The statistically lower *Fusarium* sp. was found in BARI mung-6 (11.85%) and BU mug-4 (11.85%). In case of *Alternaria* spp. the highest number was reached in BARI mung-4 (11.33%) and the lowest was found in BU mug-2 (2.06%). The highest percentage of *Ascochyta rabiei* (8.24%), *Macrophomina phaseolina* (6.70%), and *Rhizopus* sp. (7.21%) was recorded in BARI mung-4. The lowest percentage of *Ascochyta rabiei* (2.58%) and *Rhizopus* sp. (1.55%) were found in BARI mung-6 while *Macrophomina phaseolina* was not recorded in BARI mung-6 and BU mug-4. The occurrence of these fungi in mungbean seed has been reported by many other workers (Bakr *et al.* 2001, Fakir *et al.* 2001, Barua 2004). *Aspergillus flavus*, *A. niger*, *Fusarium* spp. (*F. oxysporum*, *F. moniliforme*, *F. semitectum*), *Penicillium* spp. and *M. phaseolina* were reported seed-borne in mungbean (Joyjit *et al.* 2007).

Table 3. Prevalence of different fungi in seed samples of eight mungbean varieties

Treatment	% infection					
	<i>Alternaria</i> spp.	<i>Aspergillus</i> spp.	<i>Ascochyta rabiei</i>	<i>Fusarium</i> sp.	<i>Macrophomina phaseolina</i>	<i>Rhizopus</i> sp.
BINA moog-5	3.61 c	14.42 bc	8.24 a	14.94 ab	2.06 d	5.15 b
BARI mung-3	2.58 d	14.42 bc	7.73 a	15.45 a	2.06 d	3.61 d
BARI Mung-4	11.33 a	27.30 a	8.24 a	15.45 a	6.70 a	7.21 a
BARI mung-5	3.61 c	13.91 bc	6.70 b	13.39 b	0.00 e	2.06 f
BARI mung-6	2.58 d	10.30 d	2.58 d	11.85 c	0.00 e	1.55 g
BU mug-1	4.64 b	13.39 bc	5.15 c	14.42 ab	3.09 c	4.64 c
BU mug-2	2.06 d	14.94 b	2.58 d	14.94 ab	3.61 b	2.58 e
BU mug-4	3.61 c	12.88 c	6.18 b	11.85 c	0.00 e	5.15 b
CV%	7.06	6.19	6.29	5.94	8.31	6.47

Values in a column with same letter(s) are not statistically different at 0.05 level of significance by DMRT

- *Alternaria* spp. includes *Alternaria brassicae* and *Alternaria brassicicola*.
- *Aspergillus* spp. includes *A. flavus* and *A. niger*.

## CONCLUSION

The results of the present study may be concluded as percentages of purity, moisture content and germination of eight mungbean varieties seed samples collected from different Research Institute and University were above the seed standard as per recommended by NSB. The fungi associated with seed samples were *Alternaria* spp, *Aspergillus flavus*, *A. niger*, *Ascochyta rabiei*, *Fusarium* sp, *Macrophomina phaseolina* and *Rhizopus* sp.

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