

## **Effect of Duration of Seed Soaking before Sowing on Mungbean under Rainfed Conditions in the Southern Region of Bangladesh**

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### **ABSTRACT**

A field experiment was conducted at the farming system research and development site Lebukhali, Patuakhali of Bangladesh Agricultural Research Institute during 1999 and 2000 to study the effect of seed soaking duration before sowing on yield of two mungbean varieties BARImung-2 and BARImung-5. Seeds were soaked with fresh water for 0, 2, 4, 6 and 8 hours. The results revealed that plants produced with 4 hours soaking gave the maximum seed yield (1379 kg/ha). BARImung-5 produced higher yield (1457 kg/ha) than that of BARImung 2. Control (no soaking) gave lower yield. The highest benefit cost ratio (3.51) was obtained from 4 hours soaking.

**Key words:** Mungbean variety, time of seed soaking, yield.

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### **INTRODUCTION**

Mungbean (*Vigna radiata* (L.) Wilczek) is an important pulse crop in Bangladesh. The crop is grown well in the coastal regions of Bangladesh (Agroecological zone-13) during dry winter season under rainfed condition. Under rainfed condition, uncertainty of moisture availability at the time of sowing causes poor emergence, which directly affects crop establishment and grain yield (Ahmed and Sandhu, 1989). Mungbean usually sown in this region at the end January to Mid February. The soils in this region are clay type which become compact and hard on drying (Choudhury *et al.*, 2000). Farmer in this region do not pay much attention to the mungbean cultivation. They cultivate mungbean under rainfed conditions with minimum tillage. More over the growing season of this crop is characterized by minimum rainfall and high evaporative demand. Residual soil moisture is often depleted in the process of seedbed preparation, resulting in poor germination. Seed germination and stand establishment under deficit soil moisture depend largely on the seed size and tillage condition (Hadas, 1975). Wide variation in seed size among mungbean genotypes have been reported (Tickoo *et al.*, 1988) and attempts are being made to introduce bold seeded varieties for enhancing yield (Hamid *et al.*, 1994). For imbibition and germination bolder seeds require more water than smaller seeds. Stand establishment of bold seeded mungbean under deficit soil moisture conditions may thus pose serious problem. Seeds of BARImung-5 is bolder in size and its

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seed coat is comparatively hard than BARImung-2 (smaller size) which does not properly germinate with residual soil moisture in southern region of Bangladesh. Seed can be soaked before sowing to meet the initial seed imbibition requirement. Khan *et al.* (1979) reported that seed soaking before sowing stimulate the emergence and seedling growth. This initial difference was maintained and resulted in higher grain yield. Thus the present study was undertaken to investigate weather the problem with soil moisture deficiency at sowing time can be mitigated by seed soaking before sowing under rainfed condition.

## MATERIALS AND METHODS

A field experiment was conducted at the Farming System Research and Development Site Lebukhali, Patuakhali of Bangladesh Agricultural Research Institute during January to May in rabi season of 1999 and 2000. The soil belongs to silty clay of Barisal tidal clay series in the Ganges Tidal Floodplain region (AEZ-13) and of medium high land. Rainfall and temperature data were recorded daily in the experimental site and presented in Table 1. The experiment was laid out in a split plot design with 5 replications keeping seed soaking treatment such as 0 hour soaking (control), 2 hours soaking, 4 hours soaking, 6 hours soaking and 8 hours soaking in the main plots and varieties viz. BARImung-2 and BARImung-5 in the sub plots. Care was taken to select uniform seed size of each variety and the mean seed size was 23 to 25 mg and 38 to 40 mg for BARImung-2 and BARImung-5 respectively. Moisture of the experimental field was (8 -12) % at seed sowing. Seeds were sown continuously in a row with 30 cm distance between rows. The unit plots size was 6m x 5m. The seed rate of BARImung-5 was 50 kg/ha and that of BARImung-2 was 30 kg/ha, because BARImung-5 is bolder than BARImung-2. Seeds were sown on 1<sup>st</sup> February of both the years. The experiment plot was fertilized with NPK @ 20-10-20 kg/ha in the form of urea, TSP and MP. All fertilizers were applied as basal. Data on plant height, pods per plant, seeds per pod and 1000 seed weight recorded from 10 randomly selected plants in each treatment. For seed yield an area of 3m x 1m was harvested from each plot.

**Table 1. Weather report during the study at the experimental site (1999 and 2000)**

Month	Period (Days)	Temperature °C				Rainfall (mm)	
		1999		2000		1999	2000
		Maximum	Minimum	Maximum	Minimum		
January	1-10	24.4	11.9	24.7	12.8	0	0
	11-20	27.6	14.0	25.3	10.9	0	0
	21-31	26.6	15.7	27.4	11.7	2	0
February	1-10	27.0	17.0	28.8	14.3	1	0
	11-20	26.2	15.3	31.1	14.5	4	0
	21-29	28.0	15.3	30.6	20.2	0	15
March	1-10	31.2	20.9	31.2	17.8	12	0
	11-20	31.9	21.6	34.6	19.7	1	0
	21-31	33.5	20.3	34.8	23.2	0	3
April	1-10	33.9	24.8	35.5	23.5	0	48
	11-20	33.8	23.1	34.0	24.1	64	12
	21-30	33.0	23.4	35.5	26.6	69	5
May	1-10	32.8	23.8	32.8	23.1	116	180
	11-20	34.8	26.6	32.5	24.8	13	84
	21-31	32.4	25.9	33.7	25.1	102	134

Source: Meteorological department Agargaon, Dhaka

## RESULTS AND DISCUSSION

### Effect of seed soaking

Seed yield and other characteristics studied were significantly influenced by duration of soaking (Table 2). The highest seed yield (1379 kg/ha) was obtained from the plants developed with 4 hours soaking. Higher yield obtained from 4 hours soaking was attribute to higher plant population,

## Effect of duration of seed soaking before sowing onmungbean under rainfed conditions

higher number of pods per plant and higher number of seeds per pod as discussed later. The rate of emergence and number of plants per m<sup>2</sup> were higher with 4 hours soaking which could be due to the fact that the seeds absorbed sufficient water that enhanced seed germination. Perhaps the availability of seed moisture was better with 4 hours soaking and the seeds were able to imbibe water more quickly that enhanced germination process and resulted in faster emergence and higher plant establishment. This early emergence provide more time for growth and development of the plant which contributes to the yield. The soaked seed had already met part of its imbibitions requirement which stimulate early emergence though seeds are damaged with excess moisture. Emergence with 2 and 6 hours soaking was similar and yield was statistically similar. The lower yield obtained from 0 hour soaking (control) was due to low moisture for seed germination and emergence. The yield of the crop was gradually increased up to 4 hours soaking thereafter declined. It might be due to the fact that some seeds were damaged with excess moisture. The range of yield reduction was 8.95 - 47.08 % compared to that with 4 hours seed soaking.

**Table 2. Yield and yield components of Mungbean as affected by duration of seed soaking at Lebukhali, Patuakhali (Pooled value)**

Time of soaking	Emergence/m <sup>2</sup>	Plants/m <sup>2</sup>	Plant height (cm)	Pods/plant (no.)	Seeds/pod (no.)	1000-seed weight (g)	Seed yield (kg/ha)	% yield reduction*
0 Hours	43.7d	30.30e	40.70c	9.46c	8.75c	30.78c	730e	47.08
2 hours	50.0b	37.75b	43.11a	10.71b	9.58b	31.96a	1256b	8.95
4 hours	57.4a	39.25a	43.07a	11.22a	9.91a	31.94a	1379a	-
6 hours	49.6b	35.34c	42.80b	10.76b	9.87ab	31.42b	1156c	16.17
8 hours	45.1c	34.09cd	42.97b	10.55b	9.42bc	31.33b	1052d	23.70

Note: \*Yield reduction over 4 hours soaking

Means in a column bearing the same letters do not differ significantly at 5 % level of DMRT

### Effect of variety

The varieties exerted significant influence on yield and yield contributing characters (Table 3). Average of two years data indicated that BARImung-5 produced higher yield (1457 kg/ha) than that of BARImung-2 (773 kg/ha). The higher yield obtained in BARImung-5 might be due to maximum number of pods per plant, higher number of seeds per pod and higher 1000- seed weight. The lower yield was recorded from BARImung-2 which might be due to less number of pods per plant, minimum seeds per pod and lower 1000-seed weight.

**Table 3. Yield and yield components of Mungbean as affected by variety at Lebukhali Patuakhali (Pooled average of 1999 and 2000)**

Variety	Emergence/m <sup>2</sup>	Plants/m <sup>2</sup>	Plant height (cm)	Pods/plant (no.)	Seeds/pod (no.)	1000 seed weight (g)	Seed yield (kg/ha)
BARImung-2	48.04b	36.60b	41.73b	9.80b	9.27b	23.89b	773b
BARImung-5	50.28a	34.09a	43.33a	11.28a	9.97a	39.08a	1457a

Note: Means in a column bearing the same letters do not differ significantly at 5% level of DMRT

### Interaction between soaking and varieties

Seed yield and other attributes were significantly influenced by the interaction of seed soaking duration and varieties except seeds per pod. The highest seed (1851 kg/ha) was produced by BARImung-5 when seed soaked for 4 hours before sowing. Higher seed yield of BARImung-5 compared to BARImung-2 was due to higher plants per square metre, higher pods per plant and higher seed weight. However seed yield is of BARImung-5 was gradually reduced after 4 hours

soaking (Table 4). Average of two years data indicated that soaking the seed before sowing increased the seedling emergence and finally yield per plot. Ahmed and Sandhu (1989) reported that wheat yield increased 10% due to soaking the seed for 12 hours before sowing. Khan *et al.* (1979) also reported that soaking the seeds before sowing stimulated emergence and seedling growth as a result higher grain yield in wheat. Padole (1979) however did not find any significant difference in grain yield between unsoaked and water soaked seeds in wheat. Rainfall is always uncertain in rainfed areas. Soaking the seed is preferable if available soil moisture is not sufficient in the upper soil layer for adequate stand establishment. Soaking the mungbean seed in water for 4 hours before sowing can help in establishing early uniform stand under limited soil moisture.

**Table 4. Interaction of seed soaking and variety on yield attributes of mungbean**

Soaking time	Variety	Emergence/m <sup>2</sup>	Plants/m <sup>2</sup>	Plant height (cm)	Pods/plant (no.)	Seeds/pod (no.)	1000-seed weight (g)	Seed yield (kg/ha)
T1	V1	42.4e	34.81bc	39.01c	8.86e	8.76cd	23.73c	630f
	V2	45.0cde	25.8d	42.4ab	10.07cd	8.71d	37.83b	831de
T2	V1	47.8bcde	38.69a	41.28bc	9.56de	9.08bcd	23.88c	782de
	V2	52.2ab	36.82ab	44.94a	11.87cd	10.08a	40.04a	1717b
T3	V1	56.8a	39.3a	42.70ab	10.3c	9.63ab	24.23c	898d
	V2	58.0a	39.2a	43.45ab	12.10a	10.2a	39.65a	1851a
T4	V1	49.0bcd	35.33bc	42.45ab	10.37c	9.72a	23.84c	878de
	V2	50.0bc	35.35bc	43.15ab	11.15b	10.02a	39.0a	1495c
T5	V1	44.0de	34.88b	43.24ab	9.95cd	9.12bc	23.77c	727ef
	V2	46cde	33.3c	42.70ab	11.15b	9.72a	38.89a	1370c

**Note:** Means in a column bearing the same letters do not differ significantly at 5% level of DMRT

T1= No soaking, T2= 2 Hours soaking, T3= 4 hours soaking, T4= 6 hours soaking, T5= 8 hours soaking, V1= BARImung-2, V2= BARImung-5

**Table 5. Economics of seed soaking in mungbean cultivation**

Treatment	Yield (kg/ha)	Gross return (Tk/ha)	Cost of cultivation (Tk/ha)	Gross margin (Tk/ha)	Benefit cost ratio
T1V1	630	12600	9660	2940	1.30
T1V2	831	16620	10460	6160	1.59
T2V1	782	15640	9740	5900	1.60
T2V2	1717	34340	10540	23800	3.26
T3V1	898	17960	9740	8220	1.84
T3V2	1851	37020	10540	26480	3.51
T4V1	878	17560	9740	7820	1.80
T4V2	1495	29900	10540	19360	2.84
T5V1	727	14540	9740	4800	1.49
T5V2	1370	27400	10540	16860	2.60

**Note:** V1 =BARImung-2, V2= BARImung-5

T1= No soaking, T2= 2 hours soaking, T3= 4 hours soaking, T4 = 6 hours soaking, T5 = 8 hours soaking

Input	Tk/kg	Output	Tk/kg
Seed	40.00	Mung	20.00
Urea	7.00		
TSP	15.00		
MP	10.00		

Soaking = Tk. 80.00 per manday (One manday per hectare required for seed soaking).

### Cost and return analysis

The highest gross return (37020 Tk/ha) was obtained from 4 hours soaking followed by 2 hours soaking (34340 Tk/ha) (Table 5). The lowest return was with 0 hour soaking (control). The maximum (3.51) and minimum (1.30) benefit cost ratio was obtained with 4 hours and 0 hour soaking respectively.

### CONCLUSION

Based on the results of this study it is concluded that under Patuakhali (AEZ-13) condition the optimum time of seed soaking before sowing of mungbean was 4 hours and BARImung-5 produces higher yield compared to BARImung-2.

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