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Original Research Article

Field Performance of Mungbean (*Vigna Radiata*) as Influence by Row Spacing and Number of Weeding

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ABSTRACT

An experiment was conducted at the Agronomy field of Sher-e-Bangla Agricultural University, Dhaka during January to April 2012 to study the effect of intra- row spacing and time of weeding on the performance of mungbean (cv. BARI mung-4). The experiment comprised with two factors viz. Intra-row spacing and Time of weeding. Four row spacing (S_1= 15 cm, S_2= 20 cm, S_3= 25 cm and S_4= 30 cm) and four weeding treatments (W_0= No weeding, W_1= Weeding at 15 days after sowing (DAS), W_2 = Weeding at 15 and 30 days after sowing (DAS), and W_3 = Weeding at 15, 30 and 45 days after sowing (DAS) were used. There were sixteen treatment combinations under the present study. Results showed that the highest plant height (60.26 cm) was achieved by 15 cm row spacing with three times of weeding. The highest number of leaves plant^{-1} (11.08) and dry weight plant^{-1} (15.63 g) were gained by 30 cm row spacing with three times of weeding. With the treatment combination of 25 cm row spacing with two times of weeding showed very close to the combination of 30 cm row spacing with three times of weeding. Hence, the field performance from 25 cm row spacing with two times of weeding and 30 cm row spacing with three times of weeding were significantly similar; so, from economic point of view, 25 cm row spacing followed by two times of weeding was the best treatment combination.

Key Words: BARI mung-4, row spacing, weeding and field performance.

INTRODUCTION

Mungbean [*Vigna radiata* (L.)] is one of the most important pulse crops in Bangladesh. Its edible grain is characterized by good digestibility, flavour, high protein content and absence of any flatulence effects. [1] In Bangladesh, total production of pulses is only 0.65 million ton against 2.7 million tons requirement. This means the shortage is almost 80% of the total requirement. [2] This is mostly due to low yield. [3] The reasons for low yield are

manifold: some are varietals and some are agronomic management practices . Various experiments and work on spacing of mungbean have been carried out in Bangladesh, as well as in other countries to find out the suitable plant population to get maximum yield. [4] Improper spacing reduced the yield of mungbean up to 20 to 40% [5] due to competition for light, space, water and nutrition.

The optimum spacing favors the plants to grow in their both aerial and underground parts through efficient utilization of solar radiation and nutrients. [6] Plant spacing directly affects the physiological activities through intra-specific competition. Weed is one of the most important factors responsible for low yield of crops. [7] Mungbean is not very competitive against weed and therefore weed control is essential for mungbean production. [8] Yield losses due to uncontrolled weed growth in mungbean range from 27 to 100%. [9] All crops have a stage during their life cycle when they are particularly sensitive to weed competition. In general, it ranges up to first 25 to 50% of the life time of crops. Critical period of weed competition is the range within which a crop must be weeded to save the crop from average of weeds. [7] Therefore, the optimum intra-row spacing and time of weeding could be the most important factors for better mungbean production. It is observed that mungbean seedlings and the weed seedlings emerge and grow simultaneously causing weed crop completion for nutrients, water, light etc. at the very early growth stages of the crop which continues till to the crop maturity. Weed also support to increase insect and disease infestation of the crop. The performance of mungbean may be increased through appropriate combination of optimum intra-row spacing and time of weeding. The present study was therefore, undertaken to examine the effect of intra-row spacing, time of weeding and combined effect of intra- row spacing and time of weeding on the performance of mungbean.

MATERIALS AND METHODS

The experiment was conducted at the Agronomy field of Sher-e-Bangla Agricultural University, Dhaka to study the effect of intra- row spacing and time of weeding on the performance of mungbean (cv. BARI mung-4). Geographically the experimental field was located at 23° 77' N latitude and 90° 33' E longitudes at an altitude of 9 m above the mean sea level. The soil belonged to the Agro-ecological Zone - Modhupur Tract (AEZ -28). The land topography was medium high and soil texture was silty clay with pH 6.1. The climate of the locality is subtropical which is characterized by high temperature and heavy rainfall during Kharif season (April-September) and scanty rainfall during Rabi season (October-March) associated with moderately low temperature. BARI mung-4 was used as planting material. The seeds of BARI mung-4 for the experiment were collected from BARI, Joydebpur Gazipur. There were two factors in the experiment namely intra row spacing (i.e. line to line distance) and time of weeding as mentioned Factor-1 (Row spacing: 4) S_1= 15 cm, S_2= 20 cm, S_3= 25 cm, S_4= 30 cm, and Factor-2 (Number of weeding: 4) W_0= No weeding, W_1= 1 weeding at 15 DAS, W_2 = 2 weedings at 15 and 30 DAS and W_3 = 3 weedings at 15, 30 and 45 DAS. The experiment was laid out in a 2 factors randomized complete block design (RCBD) design having 3 replications. There are 16 treatment combinations and 48 unit plots. The unit plot size was 6 m^2 (3 m × 2 m). The blocks and unit plots were separated by 1.0 m and 0.50 m spacing respectively. Lay out of the experiment was done on 2nd February 2012. Land preparation was completed on 1st February 2012 and was ready for sowing

seeds. Seeds were sown at the rate of 27 kg ha^{-1} in the furrow on 3rd February 2012 and the furrows were covered with the soils soon after seeding. The data were recorded on the following parameters plant height, number of leaves $plant^{-1}$ and dry weight $plant^{-1}$. The height of the selected plant was measured from the ground level to the tip of the plant at 15, 30, 45, 60 days after sowing (DAS) and at harvest time (70 DAS). Number of leaves per plant was counted from each selected plant sample and then averaged at 15, 30, 45, 60 DAS and at harvest time (70 DAS). Ten plants were collected randomly from each plot at 15, 30, 45, 60 DAS and at harvest (80 DAS). The sample plants were oven dried for 24 hours at 70°C and then dry weight $plant^{-1}$ was determined. The collected data were compiled and analyzed statistically using the analysis of variance (ANOVA) technique with the help of a computer package program MSTAT-C and the mean differences were adjusted by Least Significance Difference (LSD) test. [10]

RESULTS AND DISCUSSION

Plant height:

Effect of intra-row spacing: Significant variation was observed in terms of plant height at all growth stages of mungbean under the present study (Table 1). Results showed that at 30, 45, 60 DAS and at harvest, lower spacing, (S_1) showed the tallest plant (28.84, 48.02, 51.45 and 54.20 cm, respectively). At 15 DAS, S_4 showed the tallest plant (10.07 cm) where the shortest plant was recorded in S_1 (6.90 cm). But at 45, 60 DAS and at harvest the shortest plant (44.65, 46.35 and 50.42 cm respectively) was observed from S_4. The results obtained from all other treatments showed intermediate results. The results under the present study were in agreement with the findings. [11,12]

Effect of weeding: The plant height was significantly influenced by number of weeding at all growth stages of mungbean except 15 DAS (Table 1). The plant height increased with increasing time of weeding. At 30, 45, 60 DAS and at harvest, the highest plant height (28.83, 50.53, 54.98 and 57.50 cm respectively) was recorded in W_3 where the lowest was achieved with no weeding W_0 (23.37, 41.89, 42.60 and 47.65 cm, respectively). Intermediate plant height was obtained from W_1 and W_2. The result under the present study was in agreement with the findings. [13]

Table 1: Effect of intra- row spacing and/or time of weeding on plant height of mungbean.

Treatments	Plant height (cm) at different days after sowing				
	15 DAS	30D AS	45 DAS	60 DAS	At harvest
Effect of intra-row spacing					
S_1	6.9	28.84	48.02	51.45	54.2
S_2	7.89	28.04	46.94	49.24	52.96
S_3	8.75	2523	45.5	47.21	51.44
S_4	10.07	26.56	44.65	46.35	50.42
$LSD_{0.05}$	0.29	0.302	0.75	0.713	0.845
Effect of weeding					
W_0	8.31	23.37	41.89	42.6	47.66
W_1	8.62	28.31	44.77	46.34	50.08
W_2	8.55	28.25	47.93	50.33	53.77
W_3	8.5	28.83	50.53	54.98	57.5
$LSD_{0.05}$	NS	0.325	0.714	0.642	0.733
Interaction effect of intra - row spacing and number of weeding					
S_1W_0	6.61	24.11	43.99	45.15	49.09
S_1W_1	7.11	30.00	45.11	47.32	50.87
S_1W_2	6.86	30.21	50.38	55.11	56.56
S_1W_3	7.01	31.04	52.61	58.21	60.26
S_2W_0	8.16	23.76	42.31	43.03	48.61
S_2W_1	7.98	29.43	44.91	46.39	50.39
S_2W_2	7.59	29.86	48.43	51.10	54.40
S_2W_3	7.83	29.11	52.13	56.44	58.43
S_3W_0	8.69	23.51	41.63	42.01	47.23
S_3W_1	8.61	25.89	44.43	45.65	49.43
S_3W_2	8.78	25.11	46.91	48.00	52.89
S_3W_3	8.91	26.41	49.01	53.19	56.19
S_4W_0	9.99	22.11	39.63	40.19	45.69
S_4W_1	10.13	27.53	44.63	46.00	49.61
S_4W_2	9.89	27.83	45.99	47.11	51.24
S_4W_3	10.27	28.75	48.36	52.09	55.13
$LSD_{0.05}$	0.5824	0.6328	1.765	1.684	1.911
CV (%)	8.75	9.14	7.36	10.47	9.36

Interaction effect of intra - row spacing and number of weeding: Interaction between intra- row spacing and number of weeding exerted significant effect on plant height (Table 1). The highest plant height (31.04, 52.61, 58.21 and 60.26 cm at 30, 45, 60 DAS and at harvest respectively) was

observed in the 15 cm spacing with three times of weeding at 15, 30 and 45 DAS (S_1W_3) which was statistically similar with S_2W_3 at 45 DAS and at harvest. But at 15 DAS, the tallest plant (10.27 cm) was observed with S_4W_3 which was statistically similar with S_4W_0, S_4W_1 and S_4W_2. The shortest plant height was obtained with S_4W_0 (22.11, 39.63, 40.19 and 45.69 cm at 30, 45, 60 DAS and at harvest respectively) which was statistically similar with S_3W_0. The results obtained from all other treatment combinations were significantly different from highest and lowest plant height.

Number of leaves plant $^{-1}$:

Effect of intra-row spacing: Significant variation was observed in terms of number of leaves plant $^{-1}$ at all growth stages of mungbean except 15 DAS (Table 2). Results showed that higher and lower spacing indicates higher and lower number of leaves plant $^{-1}$ respectively. At 30, 45, 60 DAS and at harvest, S_4 showed the maximum number of leaves plant $^{-1}$ (7.68, 11.01, 11.24 and 9.51 respectively) where as the lowest number was achieved by S_1 (5.64, 6.74, 7.63 and 5.32, respectively). The results obtained from all other treatments showed intermediate results compared to the highest and the lowest values. The results under the present study were in agreement with the findings. [14]

Table 2: Effect of intra- row spacing and/or time of weeding on number of leaves plant^{-1} of mungbean.

Treatments	Number of leaves plant^{-1} at different days after sowing				
	15 DAS	30DAS	45 DAS	60 DAS	At harvest
Effect of intra-row spacing					
S_1	3.12	5.64	6.74	7.63	5.32
S_2	3.38	5.96	7.58	8.43	6.35
S_3	3.51	6.51	8.92	9.38	7.18
S_4	3.59	7.68	11.01	11.24	9.51
$LSD_{0.05}$	NS	0.08	0.27	0.34	0.26
Effect of weeding					
W_0	3.27	4.62	5.23	5.81	4.95
W_1	3.5	6.32	8.99	9.62	7.56
W_2	3.32	6.9	9.85	10.39	7.79
W_3	3.45	7.28	10.16	10.86	8.06
$LSD_{0.05}$	NS	0.08	0.26	0.36	0.28
Interaction effect of intra - row spacing and number of weeding					
S_1W_1	3.10	6.00	6.61	7.74	5.25
S_1W_2	3.16	6.21	7.44	8.69	5.44
S_1W_3	3.13	6.29	8.11	8.90	5.76
S_2W_0	3.30	4.44	5.00	5.71	4.86
S_2W_1	3.36	6.46	7.89	9.01	6.46
S_2W_2	3.44	6.34	8.63	9.41	6.80
S_2W_3	3.43	6.61	8.79	9.61	7.29
S_3W_0	3.43	4.86	5.26	5.99	5.00
S_3W_1	3.51	6.86	9.84	9.68	7.64
S_3W_2	3.49	6.92	10.37	10.80	7.97
S_3W_3	3.61	7.39	10.20	11.03	8.11
S_4W_0	3.54	5.11	5.89	6.34	5.11
S_4W_1	3.55	8.65	11.63	12.03	10.89
S_4W_2	3.61	8.11	12.97	12.67	10.94
S_4W_3	3.63	8.84	13.57	13.90	11.08
$LSD_{0.05}$	NS	0.19	0.56	0.766	0.22
CV (%)	4.54	8.36	7.58	9.62	9.74

Effect of weeding: Number of leaves plant $^{-1}$ was significantly influenced by number of weeding at all growth stages of mungbean except 15 DAS (Table 2). The increasing number of weeding significantly increased number of leaves plant $^{-1}$. At 30, 45, 60 DAS

and at harvest, the highest number of leaves plant^{-1} (7.28, 10.16, 10.86 and 8.06 respectively) was recorded in W_3 which was closely followed by W_2 at harvest. The lowest number of leaves plant^{-1} was achieved with no weeding W_0 (4.62, 5.23, 5.81 and 4.95 at 30, 45, 60 DAS and at harvest respectively). Intermediate result on number of leaves plant $^{-1}$ was obtained from W_1 and W_2. This result under the present study might be due to cause of unavailability of nutrient, light, air etc. because of higher weed biomass.

Interaction effect of intra - row spacing and time of weeding: Interaction between spacing and number of weeding showed significant effect on number of leaves plant $^{-1}$ at all growth stages except at 15 DAS (Table 2). Results indicated that the highest number of leaves plant $^{-1}$ (8.84, 13.57, 13.90 and 11.08 at 30, 45, 60 DAS and at harvest, respectively) was observed in the treatment combination of S_4W_3 which was statistically identical with S_4W_1 and S_4W_2 at harvest. But the lowest number of leaves plant $^{-1}$ was obtained with S_1W_0 (4.08, 4.79, 5.19 and 4.81 at 30, 45, 60 DAS and at harvest respectively) which was statistically identical with S_2W_0 and closely followed by S_3W_0 at the time of harvest. The results obtained from all other treatment combinations were significantly different compared to highest and lowest number of leaves plant^{-1}.

Dry weight plant^{-1}:

Effect of intra-row spacing: Dry weight plant^{-1} was significantly varied due to different treatment variations at all growth stages of mungbean (Table 3). Results showed that higher spacing indicated higher dry weight plant^{-1}. Under the present study, the highest dry weight plant^{-1} (2.36, 5.49, 7.79, 10.50 and 12.46 g at 15, 30, 45, 60 DAS and at harvest, respectively) was achieved by S_4 where the lowest was achieved by S_1 (0.85, 3.11, 5.28, 6.81 and 8.36 g at 15, 30, 45, 60 DAS and at harvest, respectively). The results obtained from S_2 and S_3 showed intermediate results compared to highest and lowest dry weight plant^{-1}. Similar results were found with the findings. [15]

Table 3: Effect of intra- row spacing and/or time of weeding on dry weight plant^{-1} (g) of mungbean.

Treatments	Dry weight plant^{-1}(g) at different days after sowing				
	15 DAS	30DAS	45 DAS	60 DAS	At harvest
Effect of intra-row spacing					
S_1	0.85	3.11	5.28	6.81	8.36
S_2	1.56	3.66	6.12	6.12	9.56
S_3	1.87	4.36	6.95	6.95	10.7
S_4	2.36	5.49	7.79	7.79	12.46
$LSD_{0.05}$	0.04	0.05	0.22	0.30	0.31
Effect of weeding					
W_0	1.61	3.05	4.19	5.48	6.91
W_1	1.62	3.93	6.83	8.78	10.5
W_2	1.64	4.48	7.37	9.52	11.3
W_3	1.74	4.6	7.75	10.4	12.35
$LSD_{0.05}$	0.02	0.04	0.26	0.36	0.22
Interaction effect of intra - row spacing and number of weeding					
S_1W_0	0.79	2.24	3.54	4.89	5.99
S_1W_1	0.86	3.6	5.39	6.94	8.44
S_1W_2	0.81	3.39	6.00	7.51	8.99
S_1W_3	0.94	3.54	6.19	7.89	10.00
S_2W_0	1.47	2.71	3.86	5.09	6.74
S_2W_1	1.57	4.06	6.69	8.16	10.07
S_2W_2	1.61	3.90	6.81	8.71	10.53
S_2W_3	1.60	3.99	7.11	9.12	10.90
S_3W_0	1.89	3.24	4.49	5.86	7.04
S_3W_1	1.80	4.76	7.00	9.26	11.10
S_3W_2	1.81	4.66	7.90	10.10	11.97
S_3W_3	1.96	4.80	8.40	11.07	12.87
S_4W_0	2.30	3.99	4.86	6.08	7.86
S_4W_1	2.39	5.89	8.24	10.77	12.50
S_4W_2	2.31	5.99	8.75	11.77	13.83
S_4W_3	2.45	6.07	9.31	13.53	15.63
$LSD_{0.05}$	0.07	0.10	0.55	0.62	0.65
CV (%)	5.62	8.45	7.69	9.28	10.12

Effect of weeding: Dry weight plant^{-1} was significantly influenced by number of weeding at all growth stages of mungbean (Table 3). It is remarked from the present study that the increasing time of weeding significantly increased dry weight plant^{-1}. At 15, 30, 45, 60 DAS and at harvest, the maximum of dry weight plant^{-1} (1.74, 4.60, 7.75, 10.40 and 12.35 g respectively) was recorded in W_3 which was closely followed by W_2 at 15 DAS. The lowest dry weight plant^{-1} was achieved with no weeding, W_0 (1.61, 3.05, 4.19, 5.48 and 6.91 g at 15, 30, 45, 60 DAS and at harvest, respectively).

Intermediate results on dry weight plant^{-1} were obtained from W_1 and W_2. The results under the present study were in agreement with the findings. [16,17]

Interaction effect of intra - row spacing and time of weeding: Significant influence was observed by interaction between spacing and number of weeding on dry weight plant^{-1} (Table 3). Results indicated that the highest dry weight plant^{-1} (2.45, 6.07, 9.31, 13.53 and 15.63 g at 15, 30, 45, 60 DAS and at harvest) was observed in the treatment combination of S_4W_3 which was closely followed by S_4W_1 at 15 DAS and S_4W_2 at 30 DAS. But the lowest dry weight plant^{-1} was obtained with S_1W_0 (0.79, 2.24, 3.54, 4.89 and 5.99 at 15, 30, 45, 60 DAS and at harvest respectively) which was statistically similar with S_2W_0 at 60 DAS. The results obtained from all other treatment combinations were significantly different compared to maximum and minimum dry weight plant^{-1}.

CONCLUSION

From the results of the study, it may be concluded that the field performance of mungbean cv. BARI mung-4 was better when sown at 30 cm row spacing followed 3 times of weeding. But with the treatment combination of S_3W_2 showed very close to S_4W_3. So, from economic point of view, 25 cm row spacing followed 2 times of weeding was the best treatment combination.

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