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YIELD OF MUNGBEAN AS INFLUENCED BY PLANTING GEOMETRY AND INTEGRATED FERTILIZER MANAGEMENT

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Abstract

Mungbean production is decreasing because of inappropriate management of fertilizer and plant population so a study was initiated to find out the effect of different combinations of organic and inorganic fertilizers with different plant geometry on the yield of mungbean var. BARI Mung-5. The experiment was laid out in a split- plot design with three replications. The experiment comprised of three level of plant geometry viz. S_1= 20 cm × 10 cm, S_2= 30 cm × 10 cm and S_3= 45 cm × 15 cm, and six level of fertilizers: F_0= Control (without fertilizer), F_1= Recommended dose of NPK, F_2=5 t ha^{-1}cowdung, F_3=5 t ha^{-1}cowdung with recommended dose of NPK, F_4= 2.5 t ha^{-1} cowdung with recommended dose of NPK and F_5=2.5 t ha^{-1}cowdung with half recommended dose of NPK. Among the three spacing, 30 cm × 10 cm (S_2) produced maximum seed yield (1022.8 kg ha^{-1}) while the lowest in S_3 (834.4 kg ha^{-1}). Cowdung had a significant effect on the seed yield and yield attributes of mungbean. The maximum seed yield (1038.9 kg ha^{-1}) was obtained F_4 while minimum (930.0 kg h^{-1}) by applying cowdung @5 t ha^{-1}. Among the treatment combinations, S_2F_4 was showed maximum yield (1156.7 kg ha^{-1}) when considering stover yield and biological yield. Plant spacing of 30 cm × 10 cm along with 2.5 t ha^{-1} with recommended dose of 40, 80, 30 kg ha^{-1} of Urea, TSP, MoP could be more beneficial for the farmers to get maximum yield from var. BARI Mung-5.

Introduction

Mungbean (*Vigna radiata*) is the most important pulse crop of Bangladesh and positions the third in protein substance and ranked fourth in respect of pulse cropped area (MoA, 2014). According to FAO (2013), a minimum intake of pulse by an individual should be 80 g/day, whereas it is 47.92 g in Bangladesh (BBS, 2016). In Bangladesh, total yield of pulses is only 0.65 million ton (MT) against 2.7 MT requirement. This implies the lack is practically 80% of the complete prerequisite (Rahman and Ali, 2007). Presumably, the lower yield of mungbean is one of the main reasons behind this disparity (MoA, 2005). A good quality soil should have at least 2.5% organic matter, but in Bangladesh most of the soils have less than 1.5%, and some soils even less than 1% organic matter (BARC, 2005). Crop residues and soil organic matter both could influence the diversity of soil microbial community and promote the crop growth and yield. Integrated management of chemical fertilizers and organic wastes may be an important approach for sustainable production of crops.

Organic farming express as large-scale use of animal or farm yard manure (FYM), compost, crop residues, green manuring, vermicompost, bio-fertilizers and bio-pesticides. But it may not be possible to obtain desired production from sole use of organic fertilizers. Equilibrium use of fertilizer is important to obtain maximum seed yield. Being leguminous in nature, mungbean needs low nitrogen but optimum doses of other major nutrients as per recommendation. Besides, optimum planting density is an important aspect of modern agriculture for securing good yield (Ahamed *et al.*, 2011). Absorption of efficient sunlight depends on the equal distribution of leaf area, this is possible by proper row spacing and distributing plants in the field (Naseri *et al.*, 2010). High planting density increases competition among the plants and reduce the absorption of light, water and nutrient. The plant having wider spacing produce extra branch and pod, but the number of pods per unit area become low as a result it decreases the yield (Singh *et al.*, 2003).Therefore, optimum plant population ensures normal plant growth due to efficient utilization of moisture, light, space and nutrients, thus increases the yield of crop. Considering the above facts, the study has been undertaken to find out the influence of plant spacing and combinations of fertilizers on the yield performance of mungbean variety.

Materials and Methods

The experiment was conducted at the Agronomy Field at Sher-e-Bangla Agricultural University, Dhaka during the period from March to May, 2022. The mungbean var. BARI Mung-5 of used for the study. The experiment comprised of three levels of plant spacing *viz.* S_1= 20 cm × 10 cm, S_2= 30 cm × 10 cm (BARI recommended) and S_3= 45 cm × 15 cm, and six level of fertilizers: F_0= Control (without fertilizer), F_1= Recommended dose of Nitrogen(N), Phosphorus (P) and Potassium (K) F_2=5 t ha^{-1}cowdung, F_3=5 t ha^{-1} cowdung with recommended dose of NPK, F_4= 2.5 t ha^{-1} cowdung with recommended dose of NPK and F_5= 2.5 t ha^{-1}cowdung with half recommended dose of NPK. The experiment was laid out in split-plot design having three replications. Spacing placed in the main plot whereas fertilizer in the sub -plots. The plot size was 10 m^2. The recommended dose of chemical fertilizers were applied as 40, 80, 30 kg ha^{-1} of Urea, TSP, MoP. All the fertilizers and cowdung were applied as per treatment combination by broadcasting and mixed with soil thoroughly at the time of final land preparation. Different intercultural operations (thinning, weeding, irrigation, drainage and plant protection measures etc.) were taken at different days after sowing. The insecticide Sumithion 57 EC was sprayed at the rate of 0.02% at the period of pod formation to control pod borer. No disease was observed in the experimental field. Data on pod length, pods per branch, pods per plant, seeds per pod, 1000-seed weight, seed yield were collected for different treatments. Data recorded for yield parameters and analysis of variance was done following computer package MSTAT-C programme. Mean differences among the treatments were tested with Least Significant Differences (LSD) at 5% level.

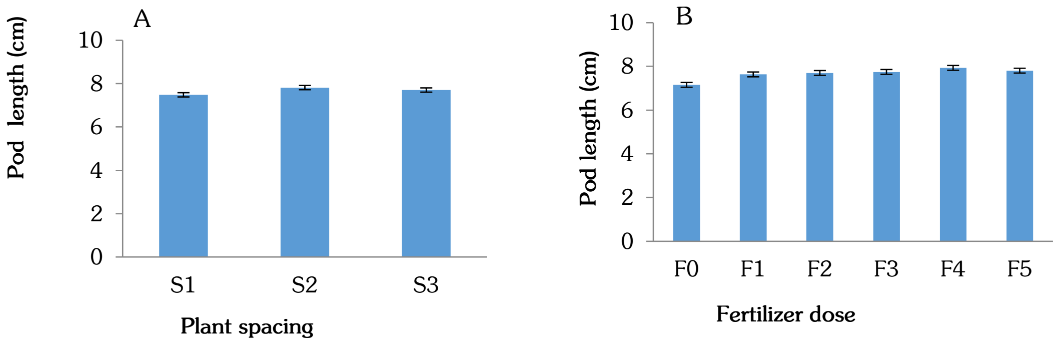
Results and Discussion

Yield contributing characters

Pod length

Different plant spacing and fertilizer dose showed significant effect on pod length (cm). The maximum pod length (7.81 cm) was observed from 30 cm × 10 cm (S_2) treatment which was statistically similar (7.7 cm) with S_3 treatment (Fig.1A). In case of fertilizer dose, maximum pod length (7.93 cm) was observed from F_4 treatment, which was statistically similar to F_5 (7.81 cm) and F_3 (7.75 cm) treatment whereas minimum pod length (7.16 cm) from F_0 treatment (Fig. 1B). In case of interaction effect the maximum pod length (8.06 cm) was observed from S_3F_4

treatment combination which was statistically similar to S_2F_4, S_2F_5, S_2F_3, S_3F_2, S_3F_3, S_3F_5, S_1F_5, S_2F_1 S_2F_2 and S_1F_4 treatment combination (Table 1). The minimum pod length (6.78 cm) was observed from S_1F_0 treatment combination which was statistically similar (7.1 cm) S_3F_0 treatment combination. Previous findings shows that the low planting density per unit area *i.e.* higher plant spacing helps the plant to uptake extra nutrient and water. They also get more sunlight which was helpful for photosynthesis, consequently more dry matter partitioning to the reproductive unit of plant (pod), thus amplified the pod length compared to the densely populated plot (Agasimani *et al.*, 1984). Nitrogen might increase the branch number plant^{-1} of mungbean as a result the pod length increased and it was in full agreement with Hossen *et al.* (2015).

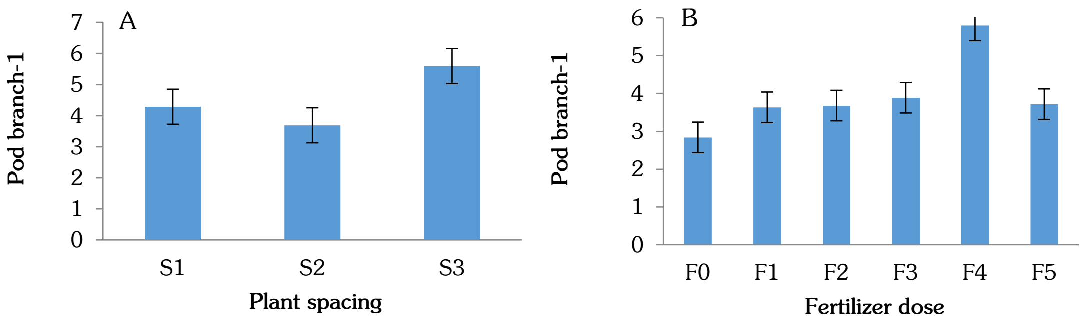


S_1 = 20 cm × 10 cm, S_2 = 30 cm × 10 cm, S_3 = 45cm × 15cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F3 = 5 t ha^{-1} cowdung with recommended dose of NPK, F_4= 2.5 t ha^{-1} cowdung with recommended dose of NPK, F_5= 2.5 t ha^{-1}cowdungwith half of recommended dose of NPK. (LSD $_{(0.05)}$ = 0.24 for plant spacing and 0.23 for fertilizer dose)

Fig.1. Effect of spacing and fertilizer on pod length of mungbean

Pods per branch

Number of pods branch plant^{-1} was influenced by different plant spacing and nutrient management. The maximum pods branch plant^{-1} (5.6) was observed from S_3 treatment where as minimum pods branch plant^{-1} (3.69) from S_2 treatment (Fig.2A). The maximum pods branch^{-1} (6.13) was observed from F_4 treatment whereas minimum (3.17) from F_0 (Fig.2B).



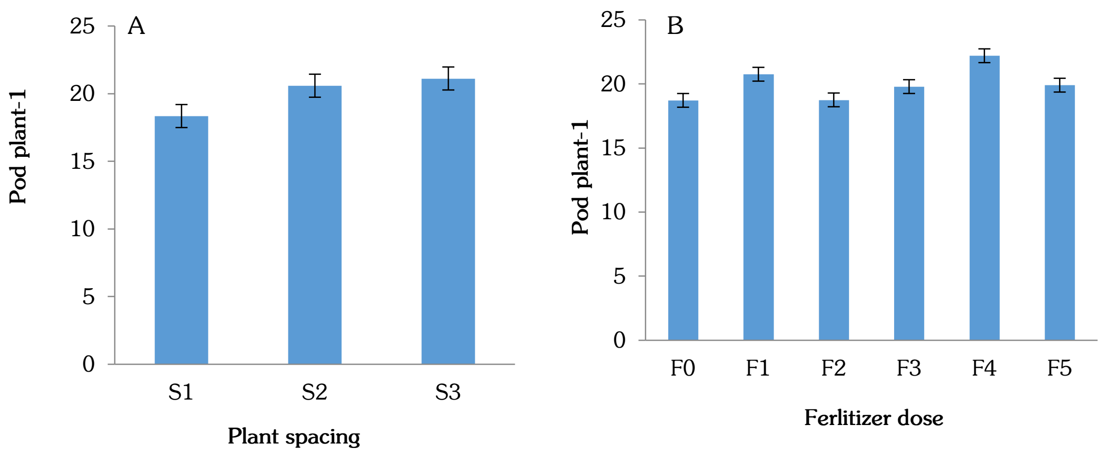
S_1 = 20cm × 10 cm, S_2 = 30cm × 10 cm, S_3 = 45cm × 15 cm,
F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F3 = 5 t ha^{-1}cowdung with recommended dose of NPK, F_4= 2.5 t ha^{-1}cowdung with recommended dose of NPK, F_5 = 2.5 t ha^{-1}cowdung with half of recommended dose of NPK.
LSD $_{(0.05)}$ = 0.13 for plant spacing and 0.12 for fertilizer dose, respectively

Fig. 2. Effect of spacing and fertilizer dose on number of pods per branchof mungbean

In case of treatment combinations, the maximum pods branch plant^{-1} (7.17) was observed from 45cm × 15 cm spacing along with 2.5 t ha^{-1}cowdung with recommended dose of NPK(S_3F_4), whereas minimum pods branch plant^{-1} (2.46) from S_2F_0 treatment combination which was statistically similar (2.50, 2.5 and 2.64) with S_2F_0, $S_1F_0$and S_2F_5 treatment combinations, respectively. Number of pods per branch might be varied due to plant spacing. Hossen *et al.* (2015) found that significant variation on number of pods per branch among mungbean plant. Aslam *et al.* (2010) also found that combined application of FYM, poultry manure and chemical fertilizer recorded higher number of pods branch^{-1} that indicating earlier of integration of the two sources in having improved mungbean productivity.

Pods plant^{-1}

Different plant spacing showed significant effect on number of pods plant^{-1} (Fig.3A). The maximum number of pods plant^{-1} (21.11) was observed from S_3 treatment, which was statistically similar to 30 cm × 10 cm (S_2) pods plant^{-1} of 20.57. The minimum number of pods plant^{-1}(18.33) was observed from S_1 treatment. It was also found that the maximum number of pods plant^{-1} (22.18) was observed from F_4 treatment whereas minimum number of pods plant^{-1} (18.7) was observed from F_0 treatment, which was statistically similar (18.74) to F_2 treatment (Fig. 3B).Interaction effect of different plant spacing and combination of organic and inorganic fertilizers showed significant variation on number of pods plant^{-1}. The experimental result showed that the maximum number of pods plant^{-1} (24.44) was observed from 45cm × 15 cm spacing along with 2.5 t ha^{-1} cowdung with recommended dose of NPK(S_3F_4) treatment combination (Table 1). While minimum number of pods plant^{-1} (17.11) was observed from S_1F_0 treatment combination which was statistically similar (17.55) with S_3F_2treatment combination (Table 1). It seems that plants grown at wider spacing met with lower intra-specific competition throughout the growing period which produces higher number of pod. Hossen *et al.* (2015) also found that plant density effects on pod number while Asaduzzaman *et al.* (2008) and Srinivas *et al.* (2002) also observed that the organic manure boost up the available form of chemical nutrients and plant easily uptake of soil nutrients which influence the number of pod.

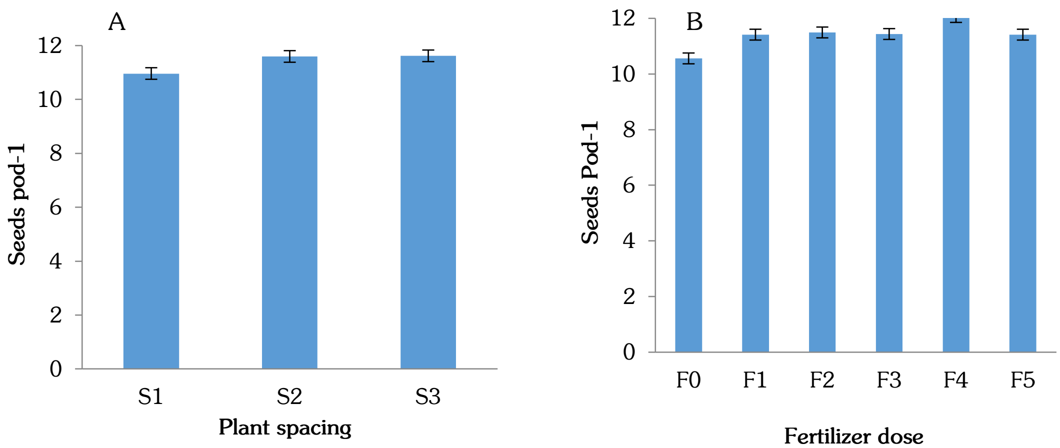


S_1 = 20 cm × 10 cm, S_2 = 30 cm × 10 cm, S_3 = 45 cm × 15 cm,
F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F3 = 5 t ha^{-1} cowdung with recommended dose of NPK, F_4= 2.5 t ha^{-1}cowdung with recommended dose of NPK, F_5 = 2.5 t ha^{-1} cowdung with half of recommended dose of NPK
LSD $_{(0.05)}$ = 0.69 for plant spacing and 0.64 fertilizer dose, respectively.

Fig. 3. Effect of spacing and fertilizer dose on pods plant^{-1} of mungbean

Seeds pod^{-1}

Various plant spacing showed significant effect on number of seeds pod^{-1} (Fig. 4A). The experimental result exhibited that the maximum number of seeds pod^{-1} (11.62) was observed from S_3 treatment, which was statistically similar (11.59) to S_2 treatment and the maximum number of seeds pod^{-1} (12.04) from F_4 treatment whereas minimum seeds pod^{-1} (10.56) from F_0 treatment (Fig. 4B). It also observed that the maximum seeds pod^{-1} (12.90) was observed from S_3F_4 treatment combination whereas minimum number of seeds pod^{-1} (9.67) from S_1F_0 treatment combination. Foysal *et al.* (2016) and Rasul *et al.* (2012) found that planting density significantly influenced the number of seeds pod^{-1}. They also found that lower planting density gave the higher number of seeds pod^{-1}. Nigamananda and Elamathi (2007) explained that organic and inorganic fertilizer mixtures showed significant effect on seeds pod^{-1}.

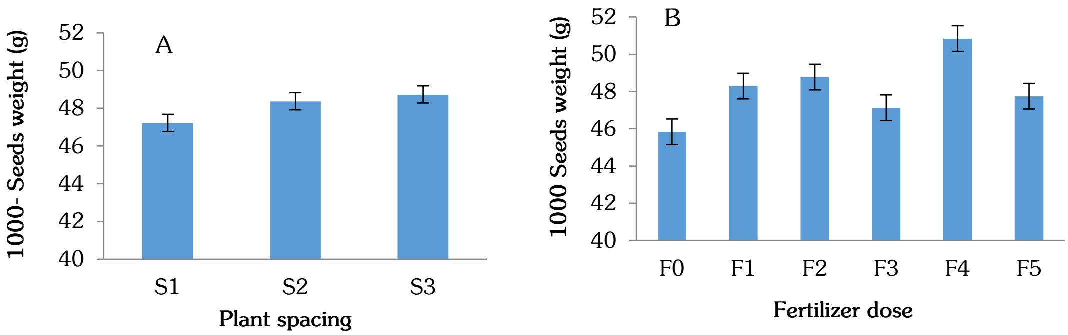


S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm, S_3: 45 cm × 15 cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F3 = 5 t ha^{-1}cowdung + Recommended NPK, F_4= 2.5 t ha^{-1}cowdung + Recommended NPK, F_5= 2.5 t ha^{-1}cowdung + 1/2 Recommended NPK . LSD $_{(0.05)}$ = 0.50 for plant spacing and 0.48 for fertilizer dose respectively.

Fig. 4. Effect of spacing and fertilizer dose on number of seed per plant of mungbean

1000-seed weight

The experimental result exhibited that the maximum 1000-seed weight (48.72 g) was observed from S_3 treatment, which was statistically similar (48.36 g) to S_2 treatment (Fig. 5A). The maximum 1000-seed weight (50.84 g) was observed from 2.5 t ha^{-1}cowdung + Recommended NPK (F_4) treatment. Whereas minimum thousand seeds weight (45.83) was observed from F_0 treatment (Fig. 5B). The experimental result showed that the maximum thousand seeds weight (51.47 g) was observed from S_3F_4 treatment combination, which was statistically similar (51.43, 49.61, 49.61, 49.52 and 49.33 g) to the treatment combinations of S_2F_4, S_1F_4, S_3F_1, S_3F_2, S_3F_1 and S_2F_2. The minimum thousand seeds weight (45.247 g) was observed from S_2F_0 treatment combination, which was statistically similar (45.74, 45.83, 46.51, 47.14, 47.34 and 47.37 g) to S_1F_0, S_1F_3, S_3F_0, S_1F_1, S_3F_3 and S_1F_2 treatment combinations (Table 1). It was also found that plant spacing significantly affected the seed yield of legumes (Porwal *et al.*, 1991). Rasul *et al.* (2012) explained that wider row spacing help to get highest 1000-seed weight of mungbean. It was also observed that combination of organic and inorganic fertilizers showed significant effect on thousand seeds weight (Razzaque *et al.,* 2015 and Hossen *et al.*, 2015).



S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm, S_3: 45cm × 15 cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F_3 = 5 t ha^{-1}cowdung + Recommended NPK, F_4= 2.5 t ha^{-1}cowdung + Recommended NPK, F_5= 2.5 t ha^{-1}cowdung + 1/2 Recommended NPK
$LSD_{(0.05)}$ =1.23 for plant spacing and 1.19 for fertilizer dose, respectively.

Fig. 5. Effect of spacing and fertilizer dose on thousand seeds weight of mungbean

Table 1. Interaction effect of spacing and fertilizer dose on yield contributing characters of mungbean

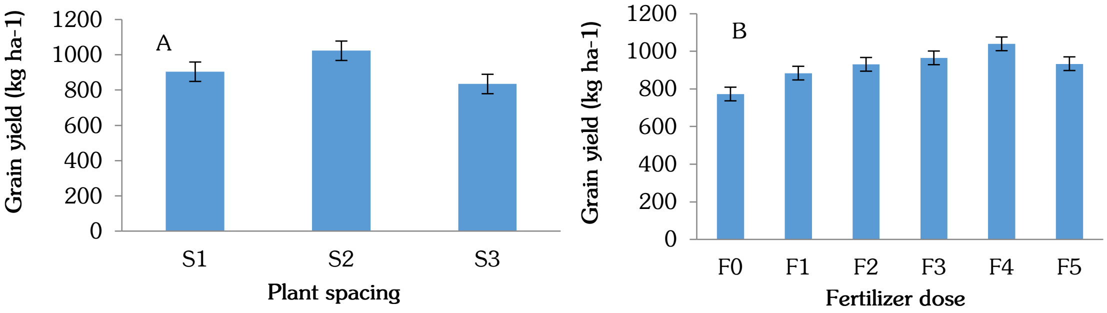
Treatment Combinations	Yield contributes characters				
	Pod length (cm)	Pods branch^{-1} (No.)	Pods plant^{-1} (No.)	Seeds pod^{-1} (No.)	1000 -seed weight (g)
S_1F_0	6.78d	2.5j	17.11i	9.67d	45.74fg
S_1F_1	7.51bc	4.5f	18.33gh	11.5bc	47.14d-g
S_1F_2	7.52bc	2.92i	18.33gh	11c	47.37c-g
S_1F_3	7.6b	5.19de	18.33gh	11c	45.83fg
S_1F_4	7.68ab	5.26d	19.33efg	11.33bc	49.61ab
S_1F_5	7.78ab	5.33d	18.56fgh	11.27bc	47.59b-f
S_2F_0	7.59b	2.46j	18.78fg	11c	45.25g
S_2F_1	7.77ab	3.82g	21.44cd	11.6bc	48.19b-e
S_2F_2	7.74ab	3.3h	20.33de	11.8bc	49.33a-d
S_2F_3	7.86ab	3.95g	21.44cd	11.8bc	48.2b-e
S_2F_4	8.06a	5.96c	22.78b	11.9b	51.43a
S_2F_5	7.86ab	2.64ij	18.67fgh	11.47bc	47.76b-f
S_3F_0	7.1cd	4.55f	20.22e	11c	46.51e-g
S_3F_1	7.62b	5.29d	22.44bc	11.13bc	49.52a-c
S_3F_2	7.84ab	5.09de	17.55hi	11.67bc	49.61ab
S_3F_3	7.79ab	6.51b	19.55ef	11.5bc	47.34d-g
S_3F_4	8.06a	7.17a	24.44a	12.9a	51.47a
S_3F_5	7.78ab	4.97e	22.44bc	11.5bc	47.88b-f
$LSD_{(0.05)}$	0.40	0.23	1.11	0.83	2.07
CV (%)	3.14	3.04	3.33	4.37	2.58

Note: S_1: 20cm × 10 cm, S_2:30cm × 10 cm, S_3: 45cm × 15 cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F_3 = 5 t ha^{-1}cowdung + Recommended NPK, F_4= 2.5 t ha^{-1}cowdung + Recommended NPK, F_5= 2.5 t ha^{-1}cowdung + 1/2 Recommended NPK

Yield parameters

Seed yield

The experimental result exhibited that the maximum seed yield (1022.8 kg ha^{-1}) was observed from S_2 treatment whereas minimum seed yield (834.4 kg ha^{-1}) from S_3 treatment (Fig. 6A). In case of fertilizer management, the maximum seed yield (1038.9 kg ha^{-1}) was observed from F_4 treatment. The minimum seed yield (772.2 kg ha^{-1}) was observed from F_0 treatment (Fig.6B). The maximum seed yield (1156.7 kg ha^{-1}) was observed from S_2F_4 treatment combination on the other hand minimum seed yield (693.3 kg ha^{-1}) was observed from S_3F_0 treatment combination (Table 2). Plant produced low seed yield in close spacing because there was huge intra plant competition between them for moisture, sunlight and soil nutrients. This result was also coincide with Rasul *et al.*, (2012); Ali *et al.* (2010); Panwar and Sirohi (1987) and Agarico (1985), who reported that, crop sown at inter-row spacing of 30 cm gave maximum seed yield while lowest seed yield at inter-row spacing of 60 cm. Consistent with organic and inorganic fertilizers mixtures effect on pods per plant, the effect was also significant on seed yield (Haque *et al.,* 2001, Asaduzzaman *et al.*, 2008 and Kamal *et al.,* 2001).

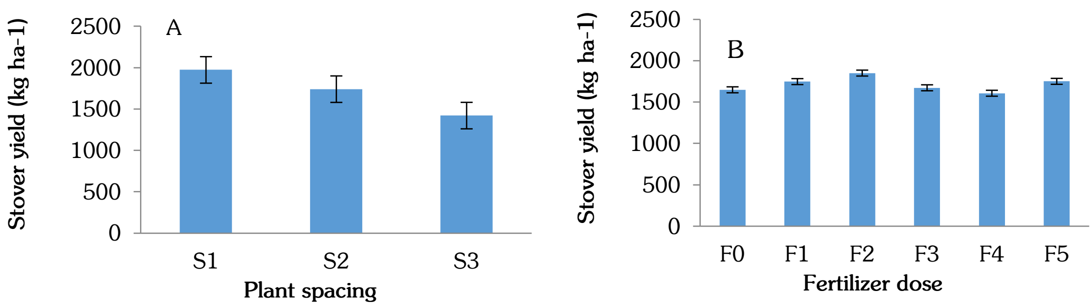


S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm (Recommended), S_3: 45 cm × 15 cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1} cowdung, F_3 = 5 t ha^{-1} cowdung + Recommended NPK, F_4= 2.5 t ha^{-1} cowdung + Recommended NPK, F_5= 2.5 t ha^{-1} cowdung + 1/2 Recommended NPK
$LSD_{(0.05)}$ = 29.59 for spacing and 27.699 for fertilizer dose, respectively.

Fig. 6. Effect of spacing and fertilizer dose on grain yield of mungbean

Stover yield

Stover yield of mungbean was significantly differed due to the application of different spacing. From the experiment result exhibited that the maximum stover yield (1974.2 kg ha^{-1}) was observed from S_1 treatment. Whereas minimum stover yield (1421.7 kg ha^{-1}) was observed from S_3 treatment (Fig. 7A);



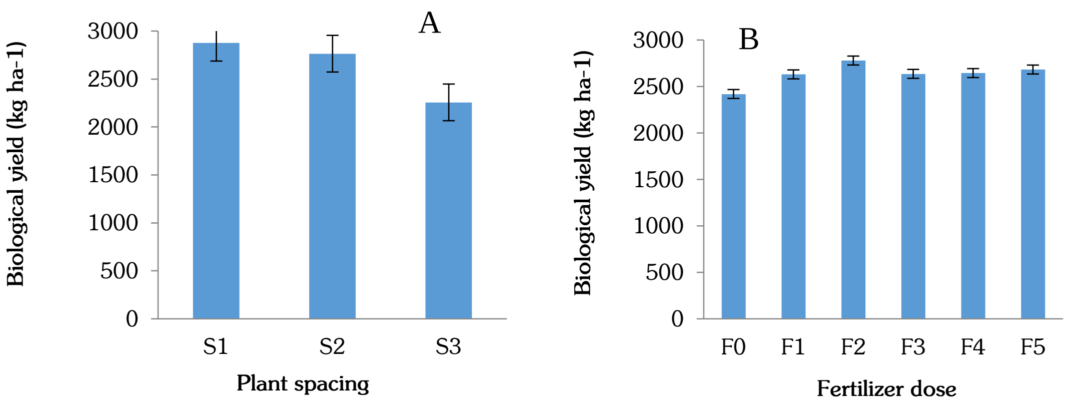
S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm, S_3: 45 cm × 15 cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F_3 = 5 t ha^{-1}cowdung + Recommended NPK, F_4= 2.5 t ha^{-1}cowdung + Recommended NPK, F_5= 2.5 t ha^{-1}cowdung + 1/2 Recommended NPK.
$LSD_{(0.05)}$= 53.43 for spacing and 50.74 for fertilizer dose, respectively.

Fig. 7. Effect of spacing and fertilizer dose on stover yield of mungbean

F_2 treatment gave the maximum stover yield (1850 kg ha^{-1}) whereas F_4 treatment gave the minimum (1606.3 kg ha-^{1}), which was statistically similar (1647.8) to F_0 treatment(Fig.7B).In different treatment combinations the maximum stover yield (2180 kg ha^{-1}) was observed from S_1F_2 treatment and minimum (1258.7 kg ha^{-1}) was from S_3F_0 treatment which was statistically similar (1280 kg ha^{-1}) to S_3F_1 treatment(Table2).These results uphold with the findings of Foysal *et al.* (2016); Kabir and Sarkar (2008) and Hossen *et al.* (2015) concluded that stover yield differed significantly among the spacing and fertilizers combinations.

Biological yield

The experimental result showed that the maximum biological yield (2878.1 kg ha^{-1}) was observed from S_1 treatment whereas minimum biological yield (2256.2 kg ha^{-1}) from S_3 treatment (Fig.8A). The maximum biological yield (2780 kg ha^{-1}) was observed from F_2 treatment which was statistically similar (2683.2 kg ha^{-1}) with F_5 treatment where the minimum biological yield (2420 kg ha^{-1}) from F_0 treatment(Fig.8B). In case of the application of different spacing and fertilizer management the maximum biological yield (3076.7 kg ha^{-1}) was observed from S_1F_2 treatment combination which was statistically similar (3006.7, 2973.3, 2930, 2873.7 kg ha^{-1}) from S_2F_2, S_2F_1, S_1F_5 and S_1F_4 treatment combinations whereas minimum biological yield (1952 kg ha^{-1}) from S_3F_0 treatment combination, which was statistically similar (2083.3 kg ha^{-1}) to S_3F_1 treatment combination (Table 2).The more biomass produced at low spacing because of maximum plant population (Ghasempour and Ashori, 2014 and Khan *et al.* 2001).The use of cowdung increased the biological yield of legumes (Mahboob and Asghar, 2002).



S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm, S_3: 45cm × 15 cm, F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F_3 = 5 t ha^{-1}cowdung + Recommended NPK, F_4= 2.5 t ha^{-1}cowdung + Recommended NPK, F_5= 2.5 t ha^{-1}cowdung + 1/2 Recommended NPK

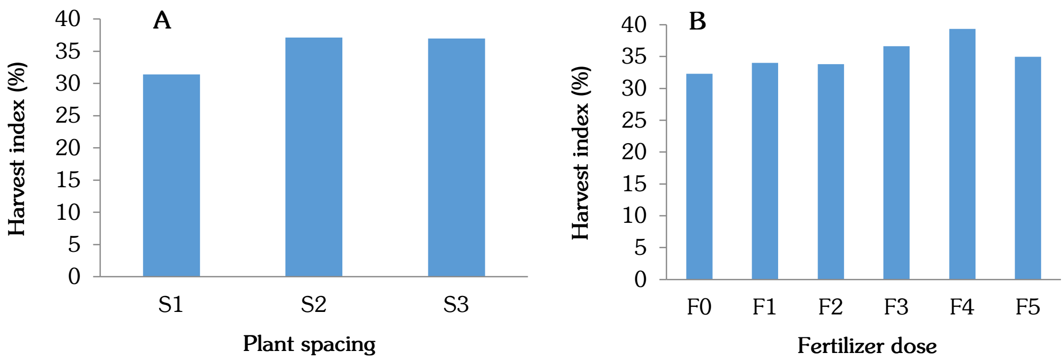
$LSD_{(0.05)}$ = 140.53 for spacing and 132.32 for fertilizer dose, respectively

Fig. 8. Effect of spacing and fertilizer dose on biological yield of mungbean

Harvest index

Harvest index of mungbean was significantly differed due to the application of different spacing and combination of organic and inorganic fertilizers. The maximum harvest index (37.14%) was observed from S_2 treatment which was statistically similar (36.98%) with S_3 treatment (Fig. 9A). On the other hand the maximum harvest index (39.35%) was observed from F_4 treatment, whereas minimum harvest index (32.28%) from F_0 treatment (Fig. 9A). The result of the investigation also revealed that the maximum harvest index (44.71%) was observed from S_2F_4

treatment combination while minimum (28.19%) was observed from S_1F_0 treatment combinations followed by (29.14, 29.97 and 31.06 %) with S_1F_2, S_1F_1 andS_1F_5 treatment combinations (Table 2). Row spacing (40 cm) helped to get highest harvest index of mungbean as also supported by Mansoor *et al.* (2010) and Khan *et al.* (2001).



S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm, S_3: 45 cm × 15 cm, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1} cowdung, F3 = 5 t ha^{-1} cowdung + Recommended NPK, F_4= 2.5 t ha^{-1} cowdung + Recommended NPK, F5= 2.5 t ha^{-1} cowdung + 1/2 Recommended NPK
$LSD_{(0.05)}$ = 2.07 for spacing and 1.93 for fertilizer dose, respectively

Fig. 9. Effect of spacing and fertilizer dose on biological yield of mungbean

Table 2. Interaction effect of spacing and fertilizer dose on yield characters of mungbean

Treatment Combinations	Yield character			
	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (%)
S_1F_0	770k	1961.3b	2731.3c-f	28.191h
S_1F_1	850h-j	1986.7b	2836.7b-e	29.97gh
S_1F_2	896.7f-h	2180a	3076.7a	29.14h
S_1F_3	950de	1870cd	2820b-f	33.69d-f
S_1F_4	1046.7bc	1827de	2873.7a-d	36.42b-e
S_1F_5	910e-g	2020b	2930a-c	31.06f-h
S_2F_0	853.3h-j	1723.3f	2576.7fg	33.12e-g
S_2F_1	996.7cd	1976.7b	2973.3a-c	33.52d-g
S_2F_2	1050b	1956.7bc	3006.7ab	34.92c-e
S_2F_3	1050b	1596.7g	2646.7d-g	39.67b
S_2F_4	1156.7a	1430.3i	2587e-g	44.71a
S_2F_5	1030bc	1763ef	2793b-f	36.88b-d
S_3F_0	693.3l	1258.7j	1952j	35.52c-e
S_3F_1	803.3jk	1280j	2083.3ij	38.56bc
S_3F_2	843.3ij	1413.3i	2256.7hi	37.37bc
S_3F_3	893.3f-h	1550gh	2443.3gh	36.56b-e
S_3F_4	913.3ef	1561.7g	2475gh	36.9b-d
S_3F_5	860g-i	1466.7hi	2326.7h	36.96b-d
$LSD_{(0.05)}$	47.98	87.89	229.18	3.34
CV (%)	3.13	3.08	5.22	5.69

Note: S_1: 20 cm × 10 cm, S_2: 30 cm × 10 cm, S_3: 45 cm × 15 cm F_0 = Control, F_1 = BARI Recommended NPK, F_2 = 5 t ha^{-1}cowdung, F_3 = 5 t ha^{-1}cowdung + Recommended NPK, F_4= 2.5 t ha^{-1}cowdung + Recommended NPK, F_5= 2.5 t ha^{-1}cowdung + 1/2 Recommended NPK

Conclusion

Different yield and yield contributing parameters were significantly influenced by different spacing and fertilizer combinations. Based on the above results it can be concluded that plant spacing at 30 cm × 10 cm along with the application of 2.5 t ha^{-1} cowdung with recommended doses of 40, 80, 30 kg ha^{-1} of Urea, TSP, MoP increased the overall productivity of mungbean.

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