

YIELD RESPONSE OF BARLEY VARIETIES UNDER TWO DIFFERENT TILLAGE CONDITIONS IN MODERATELY SALINE SOILS OF KHULNA

¹Md. Masudul Haque* ¹Md. Sanaul Islam, ²Md. Sarwar Jahan, ²Md. Monirul Islam
¹soil Science Discipline ²agrotechnology Discipline Khulna University, Khulna Bangladesh

ABSTRACT

About million of hectare of coastal soils of Bangladesh are monocropped with T. aman during monsoon and usually most of these lands remain fallow during dry season due to high soil salinity, lack of irrigation water and proper alternative varieties of rice as well as other non rice crops. This experiment was carried out with a view to search an alternative crop species to intensify the crop intensity of the coastal saline soils. Thus, six barley varieties, developed by BARI were tested under no-tillage and conventional tillage system to identify the most suitable varieties for coastal region of Khulna. Overall performance of barley varieties under tillage system was much better than that of no-tillage cultivation system. Grain yield under no-tillage system found insignificant among the varieties which varied from 0.17 to 0.33 t ha⁻¹. Under Conventional tillage system this index varied from 1.29 to 1.86 t ha⁻¹. Maximum yield was recorded for BARI barley-5 (1.86 t ha⁻¹) with a harvest index 57.33%. Although none of the parameters studied were found statistically significant except spike length under conventional tillage system.

Key words: Barley, No-tillage, Conventional tillage, Yield, Salinity

INTRODUCTION

Barley (*Hordeum vulgare* L.) is an important cereal crop after maize, wheat and rice in grain production (136 million tons) and in area of cultivation (566,000 km²) (FAOSTAT, 2009). It is cultivated successfully in a wide range of climate. This crop has potentials for growing under drought and saline conditions. It requires less input like fertilizer, irrigation, and insecticides (Alam et al., 2007a). But the area of cultivation of barley is gradually decreasing in Bangladesh (FAO, 1993-2002). Major causes behind that are lack of high yielding and hull-less varieties. However, barley cultivation can be popularized among growers, if the crop could be made suitable for cultivation in the areas where it grows well and rice, wheat and maize cannot be grown profitably for the stress environment (Alam et al., 2007b). In Bangladesh, more than 30% of the net cultivable land is in the coastal area. Of the 2.85 million ha of coastal and off-shore areas, about 1.0 million ha of arable land are affected by varying degrees of soil salinity (Karim et al., 1990). The coastal saline soils are at present mono-cropped with rice. Most lands remain fallow in the dry season due to higher soil salinity and lack of good quality irrigation water (Karim et al., 1990; Mondal, 1997). Cropping intensity and production levels are much lower in this region than the other parts of the country (BBS, 2001). Under these circumstances the present research work has been taken to evaluate the yield potential of six BARI Barley varieties under no-tillage and conventional tillage systems in khulna region.

MATERIALS AND METHODS

The experiment was conducted at the Field Laboratory of Agrotechnology discipline, Khulna University, Khulna during December 2009 to March 2010. Soil characteristics of the experimental field were



medium high land of clay loam texture and moderate salinity level. Six varieties viz. BARI barley-1, BARI barley-2, BARI barley-3, BARI barley-4, BARI barley-5 and BARI barley-6 were collected from BARI and were used as the research material of the study. The selected varieties were tested under two different tillage systems i.e. no-tillage and conventional tillage. The experiment was laid out in a Completely Randomized block Design (RCBD) with three replications. The seeds were treated with fungicide Vitavax-200 before 24 hours of sowing at the rate of 2.5 g kg⁻¹ seed to control the seed borne diseases. Seeds were sown in straight line furrows at the rate of 150 kg ha⁻¹. During whole growing period no fertilizer and irrigation were applied to the experimental plots. The crop was harvested at full maturity. Data were collected from 5 randomly selected plants from each of the plots prior to harvest. The following yield parameters were considered for data analysis: spike length (cm), number of grains spike⁻¹, thousand grains weight (g), grain yield (t ha⁻¹), biological yield (t ha⁻¹) and harvest index (%). The collected data on different parameters were analyzed following analysis of variance (ANOVA) technique using MSTAT-C program. Means were compared by least significance difference (LSD) test.

RESULTS AND DISCUSSION

Spike Length (Cm)

Spike length of tested barley varieties with no- tillage system varied from 14.58 to 16.49 cm (Table 1) and no significant differences were noticed among the varieties where as BARI Barley-2 produced the tallest spike length (18.19 cm) with conventional tillage system and which was significantly higher than other varieties except BARI Barley-1 (17.34 cm) (Table 2). Razzaque and Rafiquzzaman (2006) conducted experiment on effect of sowing time on the yield and yield attributes of barley under rainfed condition at Kalapara, Patuakhali and reported that BARI barley-2 produced higher spike length. Similar observation was also reported by Begum et al. (1999).

Number of Grain Spike⁻¹

Maximum number of grains spike⁻¹ was recorded in BARI barley-3 and minimum in BARI barley-5 in both tillage systems (Table 1 and Table 2). But for this parameter all the varieties performance was better in conventional tillage system than that of no-tillage system. However, the number of grains spike⁻¹ was higher than that of the experiment conducted by Rahman and Munira (2009).

Thousand Grain Weight (G)

The thousand grains weight of the tested six varieties was found statistically significant with no-tillage system and the maximum weight (33.80 g) was estimated with the variety BARI barley-5 (Table 1). In conventional tillage system no significant differences were observed among the varieties and the weight varied from 23.95 to 27.20 g where the maximum weight was found with the variety BARI barley-2 (Table-2). Similar result was also reported by Rahman and Munira (2009).

Grain Yield (t ha⁻¹)

Grain yield of the tested six varieties with both the tillage systems were found statistically similar. However, with no-tillage system grain yield varied from 0.17 to 0.33 t ha⁻¹ (Table 1) whereas the maximum grain yield (1.86 t ha⁻¹) with conventional tillage system was estimated with the variety BARI barley-5 and the minimum yield was noticed with BARI barley-1 (Table 2). The results were almost similar with Rahman and Munira (2009). Rao and Dao (1996) found the no-tillage system occasionally reduced yield due to



decreased N availability. Ahmad et al. (2007) conducted experiment on the effect of tillage practices on barley production under rainfed condition in Jordan and were found that grain yield of chisel tillage was 1.51 t ha⁻¹ and 1.34 t ha⁻¹ for disk plow tillage systems of cultivation.

Biological Yield (t ha⁻¹)

Biological yield varied from 0.61 to 0.94 t ha⁻¹ (Table 1) with no-tillage system and was found significantly variable among the varieties. The highest biological yield (0.94 t ha⁻¹) was estimated with the variety BARI barley-2 and the others were found statistically similar in yield. In conventional tillage system the highest biological yield was found with the variety BARI barley-2 and the lowest biological yield was estimated with BARI barley-6 (Table 2). Ahmad et al. (2007) and Al-Issa (2001) also reported lower biological yield.

Harvest Index (%)

The harvest index of the tested varieties with both the tillage systems were found statistically insignificant and the highest value of harvest index with no-tillage and conventional tillage was estimated 38.03% and 57.76% with the variety BARI barley-6 and BARI barley-5 respectively (Table 1 and table 2).

SUMMARY AND CONCLUSION

The experiment was carried out at the Field Laboratory of Agrotechnology discipline, Khulna University, Bangladesh to evaluate the yield performance of six BARI barley varieties under conventional tillage and no-tillage conditions. The result of the experiment showed that conventional tillage system is much better than no-tillage system under the study area irrespective of barley varieties. In both the systems BARI barley-5 was found better in grain yield and yield contributing characters. However, the yield performance did not varied significantly with the varieties either in conventional tillage or in no-tillage conditions individually. In this experiment no fertilizer and irrigation were applied and obviously overall yield was much lower than average country yield (2.5 t ha⁻¹) of Bangladesh. So, further experiment with sowing time, manures and fertilizers and irrigation are recommended.

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Table 1. Yield and yield components of six varieties of barley with no-tillage condition

Variety	Spike length (cm)	No. of grains spike ⁻¹	Thousand grains weight (g)	Grain yield (t ha ⁻¹)	Biological Yield (t ha ⁻¹)	Harvest index (%)
BARI barley -1	16.44	35.26	32.71ab	0.22	0.70b	31.43
BARI barley -2	16.49	36.13	31.41abc	0.33	0.94a	35.11
BARI barley -3	14.58	37.06	28.56bc	0.17	0.61b	27.87
BARI barley -4	15.09	35.06	29.39bc	0.25	0.66b	37.88
BARI barley -5	14.63	27.00	33.80a	0.21	0.65b	32.31
BARI barley -6	14.98	36.46	27.35c	0.27	0.71b	38.03
CV (%)	7.68	11.10	5.47	22.09	13.23	10.59
Level of significance	NS	NS	0.01	NS	005	NS
LSD	-	-	4.32	-	0.1726	-



Table 2. Yield and yield components of six varieties of barley with conventional tillage condition

variety	Spike length (cm)	No. of grains spike ⁻¹	of Thousand grains weight (g)	Grain Yield (t ha ⁻¹)	Biological Yield (t ha ⁻¹)	Harvest Index (%)
BARI barley -1	17.34ab	44.13	26.95	1.29	3.00	43.00
BARI barley-2	18.19a	48.53	27.20	1.64	3.56	46.07
BARI barley -3	16.37b	50.26	24.17	1.41	3.21	43.93
BARI barley -4	16.57b	47.93	24.51	1.60	3.39	47.20
BARI barley -5	16.62b	41.66	26.92	1.86	3.22	57.76
BARI barley -6	16.74b	46.80	23.95	1.35	2.44	55.33
CV (%)	3.34	12.21	7.81	19.66	20.90	11.73
Level of significance	0.05	NS	NS	NS	NS	NS
LSD	1.032					

NS – Not significant

LSD – Least Significance Difference

