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EFFECT OF SPACING AND WEEDING REGIMES ON YIELD AND YIELD ATTRIBUTES OF BRRI dhan56

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ABSTRACT

Sen A, Sarkar MAR, Begum M, Zaman F, Ray S (2014) Effect of spacing and weeding regimes on yield and yield attributes of BRRI dhan56. *Int. J. Sustain. Crop Prod.* 9(3), 1-9.

The experiment was conducted at the Agronomy Field Laboratory of Bangladesh Agricultural University, Mymensingh during June to October 2013 to examine the effect of spacing and weeding regimes on yield and yield attributes of short duration transplant *Aman* rice (cv. BRRI dhan56). Treatments were four spacings *viz*. 25 cm × 10 cm, 25 cm × 15 cm, 20 cm × 10 cm and 25 cm × 20 cm and five weeding regimes *viz*. no weeding, one hand weeding at 20 DAT, two hand weedings at 20 and 35 DAT, three hand weedings at 20, 35 and 50 DAT and herbicide pyrazosulfuron-ethyl 10WP. The following treatments were arranged in Randomized Complete Block Design with three replications. Results from the study noticed that the number of effective tillers hill^{-1}, grains panicle^{-1}, grain yield and harvest index were the highest in 25 cm × 15 cm plant spacing and three hand weedings (at 20, 35 and 50 DAT) plots and the lowest was 20 cm × 10 cm spacing under no weeding plots. The highest weed population and dry weight were obtained from 20 cm × 10 cm spacing with no weeding treatment and the lowest was found in 25 cm × 15 cm spacing with Pyrazosulfuron-ethyl 10 WP application. Therefore, it can be concluded that short duration *Aman* rice (cv. BRRI dhan56) can be transplanted at 25 cm × 15 cm spacing with three hand weedings at 20, 35 and 50 DAT to achieve maximum yield.

Key words: *spacing, weed management, yield, BRRI dhan56*

INTRODUCTION

Rice (*Oryza sativa* L.) is the main food in Bangladesh and the total area of rice in Bangladesh is about 28.49 million hectares with a production of 33.54 million tons, (BBS 2011). About 77.07% of cropped area of Bangladesh is used for rice cultivation, with annual production of 33.54 million tons from 11.52 million ha of land (BBS 2011). In Bangladesh, there are three distinct growing seasons of rice namely, *Aus*, *Aman* and *Boro*. The production of rice in *Aus*, *Aman* and *Boro* seasons are 2.63, 12.74 and 18.53 million tons, respectively (AIS 2011). The majority of rice growing area is covered by *Aman* rice comprising 52% of the total rice area. *Aman* rice covers 5.64 million ha of land with a production of 12.79 million tons and the average yield of rice in Bangladesh is 2.9 t ha^{-1}, which is lower than many rice growing countries of the world (BBS 2011).

Plant spacing is an important factor, which plays an important role in the growth, development, and yield of rice by providing optimum spacing to the plants to grow both aboveground and underground parts through efficient utilization of solar radiation and nutrients (Khan *et al.* 2005). Closer spacing hampers intercultural operations. Also in a densely populated crop, the inter-plant competition is very high for nutrients, air and light, which usually results in mutual shading, lodging and thus favours more straw yield than grain yield (Alam *et al*. 2012). On the other hand, desired hills unit^{-1} area cannot be obtained under wider plant spacing, which ultimately reduces yield unit^{-1} area. So, it is important to determine optimum spacing for maximizing the yield of rice (Baloch *et al*. 2002).

The climatic and edaphic conditions of Bangladesh in *Aman* season are highly favourable for proper growth of numerous species of weeds which offer a tough competition with the crop causing a substantial yield loss (Mamun 1988). Weeds are the major biotic problem to increase the production of rice worldwide. The yield of transplant *Aman* rice in Bangladesh is much lower than that of transplanted rice in other rice growing countries. Among the various factors, severe weed infestation is the most important for such low yield. Many investigators have reported a great loss in the rice yield due to weed infestation from different parts of the world (Nandal and Singh, 1994). The extent of yield losses due to weed infestation is highly variable and it depends on the type of weed species, time of weed association with crops and the management practices (mechanical and chemical) that are used to control the weeds (Mitra *et al*. 2005). The yield losses due to weed competition in transplant Aman rice are about 30-40% in Bangladesh (BRRI 2008). Therefore, proper weed management is essential for satisfactory rice production in Bangladesh. Weed free period during the critical period of competition is essential for obtaining an optimum rice yield. So, for archiving the maximum yield mechanical, cultural or chemical means of weed control is necessary. Herbicidal weed control methods offer an advantage to save labour and money, as a result, regarded as cost effective (Ahmed *et al.* 2005). Chemical weed control has been gaining popularity in Bangladesh in recent years (Hossain 2006) leading to high growth rate in herbicide use in rice cultivation. The main reasons are scarcity of labour during peak growing season, and also lower weeding cost by using herbicides. In some cases, however, phytotoxicity of herbicides was observed which eventually led to lower yield performance (Islam 2001; Rahman 2001; Mondal *et al.* 1995). Thus, the appropriate weeding practices need to be adopted by the farmers for reducing weed infestation and maximizing rice yield.

Therefore, the present study was undertaken to see the effect of spacing and weeding regimes on the yield and yield attributes of short duration transplant *Aman* rice (cv. BRRI dhan56).

MATERIALS AND METHODS

An experiment was conducted at the Agronomy Field Laboratory of Bangladesh Agricultural University, Mymensingh during June to October 2013. The experimental site belongs to the Sonatala series of Old Brahmaputra Floodplain Agro-ecological Zone (AEZ-9) having non-calcareous dark grey floodplain soils (UNDP and FAO, 1998). The experimental field was medium high land having sandy loam soil with pH 6.8. Soil of the experimental field was low in organic matter content (1.027%) and its general fertility level was also low (0.09% total N, 5.68 ppm available P, 49.12% exchangeable K and 82.8 ppm available S) with high temperature, high humidity and heavy precipitation with occasional gusty winds during April to September and scanty rainfall associated with moderately low temperature during October to March. Treatments were four spacings *viz*. 25 cm × 10 cm, 25 cm × 15 cm, 20 cm × 10 cm and 25 cm × 20 cm and five weeding regimes *viz*. no weeding, one hand weeding at 20 DAT, two hand weedings at 20 and 35 DAT, three hand weedings at 20, 35 and 50 DAT and herbicide pyrazosulfuron-ethyl 10WP. The following treatments were arranged in Randomized Complete Block Design with three replications. The size of each unit plot was 2.5 m × 2.0 m. Distance between replication to replication and between plot to plot was 1 m and 0.5 m, respectively. The drought tolerant and short duration Aman rice cv. BRRI dhan56 was used in this eperiment. It was collected from the Bangladesh Rice Research Institute, Joydebpur, Gazipur. Seedlings were raised in the wet seedbed method. Before seedlings, seeds were soaked in the water for 24 hours. Then it were taken out of water, covered with wet gunny bags and kept for sprouting. The sprouted seeds were broadcast uniformly in a well prepared nursery bed on 30 June 2013. Seedling were ready for transplanting at 30 days after sowing when sixth or seventh leaves were formed. All weeds and stubble were removed from the land. The land was fertilized with urea, triple super phosphate, muriate of potash, gypsum and zinc sulphate as per BRRI recommendations. The entire amounts of triple super phosphate (TSP), muriate of potash (MoP), gypsum and zinc sulphate were applied at final land preparation. Urea was applied as top dressing in three equal splits at 15, 30 and 45 days after transplanting. Thirty one days old seedlings were carefully uprooted from the nursery bed then transplanted at the well puddled plots @2 seedlings hill^{-1} on 31 July 2013 maintaining spacing as per experimental treatments. The crop was harvested at full maturity and when 90% of the seed became golden yellow in color. Five hills (excluding border hills) and central 1 m^2 were selected randomly from each unit plot and uprooted before harvesting for recording number of effective tillers hill^{-1}, number of non-effective tillers hill^{-1}, panicle length (cm), grains panicle^{-1} spikelets panicle^{-1}, sterility %, 1000-grain weight (g), grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}), Harvest index (%). After sampling, a harvest area of central 1 m × 1 m was selected from each unit plot. The harvested crop of each plot was separately bundled, properly tagged and then brought to threshing floor. The grains were cleaned and sun dried to a moisture content of 14%. Finally grain and straw yields per plot were recorded and converted to t ha^{-1}. Data on individual plant parameters were recorded from five randomly selected hills of each plot and those on 1000-grain weight, grain yield, straw yield, biological yield, harvest index were recorded from the whole plot at harvest. Data on weed population (m^{-2}) and weed dry weight (g m^{-2}) were recorded at 65 DAT by placing a one square meter plant counter randomly at three positions in each plot to record average plant population (m^{-2}). Then their dry weights were recorded by drying them in an electric oven at 70±5^{0}C temperature for 72 hours until constant weight was reached. The weed samples were weighed carefully using an electric balance. Collected data were analyzed statistically using MSTAT-C programme and the means were compared by Duncan's Multiple Range Test (DMRT) at 5% level of probability (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Effect of spacing on the yield

Plant spacing also had a significant effect on the number of effective tillers hill^{-1}, number of non-effective tillers hill^{-1}, grains panicle^{-1} spikelets panicle^{-1}, sterility %, grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}), harvest index (%) except panicle length (cm), 1000-grain weight (g) (Table 1). The highest number of effective tillers hill^{-1} (9.29), number of grains panicle^{-1} (120.35), grain yield (t ha^{-1}) (4.73), harvest index (%) were obtained from spacing 25 cm × 15 cm. The lowest number of effective tillers hill^{-1}, straw yield (t ha^{-1}) was obtained from spacing 25 cm × 10 cm except number of non-effective tillers hill^{-1}, number of grains panicle^{-1}, grain yield (t ha^{-1}), biological yield (t ha^{-1}) (Table 1). The increased grain yield at the plant spacing 25 cm × 15 cm might be due to the cumulative effect of the highest number of effective tillers hill^{-1} and grains panicle^{-1} obtained from this spacing. Plant spacing directly affect the normal physiological activities as well as yield (Oad *et al*. 2001). Grain yield was higher in wider spacing and lower in closer spacing. This might be due to limitation of light, nutrient, and water in close spacing plant and vice-versa.

Effect of weed management on the yield

The effect of weed management on the yield and yield contributing character was significant except 1000-grain yield (t ha^{-1}) (Table 1). The highest number of effective tillers $hill^{-1}$ (10.59), number of grains $panicle^{-1}$ (130.17), grain yield (4.91 t ha^{-1}), biological yields (10.97 t ha^{-1}) were obtained from three hand weedings at 20, 35 and 50 DAT. The increased grain yield in this treatment might be due to the cumulative effect of the highest number of effective tillers $hill^{-1}$ and grains $panicle^{-1}$ obtained from this treatment. The lowest number of number of effective tillers $hill^{-1}$ (5.63), number of grains $panicle^{-1}$ (66.33), grain yield (3.13 t ha^{-1}), biological yields (8.45 t ha^{-1}) were obtained from no weeding treatment. Ahmed *et al*. 2005 studied critical period of weed competition in transplant rice and reported that critical period of crop weed competition ranged up to 40 DAT. Grain and straw yield decreased with increase weed competition duration. They further observed that one weeding was not sufficient to control the weeds effectively and if one weeding was to be done, it was better to do between 20 and 40 DAT that also partially supported the present experimental result.

Effect of interaction between spacing and weed management on yield

The interaction effect between plant spacing and weed management was significant on number of effective tillers $hill^{-1}$, number of non-effective tillers $hill^{-1}$, spikelets $panicle^{-1}$, sterility %, grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}), harvest index (%) except panicle length (cm), grains $panicle^{-1}$, 1000-grain weight (g) (Table 2). It was observed that the highest number of effective tillers $hill^{-1}$ (11.51), grain yield (5.35 t ha^{-1}) and harvest index (47.51%) was obtained from the plant spacing 25 cm × 15 cm combined with three hand weedings at 20, 35 and 50 DAT which was statistically identical with the treatment of spacing 25 cm x 10 cm and three hand weedings at 20, 35 and 50 DAT. The lowest grain yield (1.90 t $ha^{-1)}$ was obtained from the interaction between 20 cm × 10 cm spacing and no weeding control.

Table 1. Effect of spacing and weed management on the yield and yield contributing characters of T. *Aman* rice cv. BRRI dhan56 at harvest

Spacing	**Number of effective tillers hill^{-1}**	**Number of non-effective tillers hill^{-1}**	**Panicle length (cm)**	**Number of grains panicle^{-1}**	**Number of sterile spikelets panicle^{-1}**	**Sterility (%)**	**1000-grain weight (g)**	**Grain yield (t ha^{-1})**	**Straw yield (t ha^{-1})**	**Biological yield (t ha^{-1})**	**Harvest index (%)**
S_1	7.58c	2.55a	21.58	113.89b	16.49a	13.48b	20.02	4.23c	5.50c	9.72c	43.18b
S_2	9.29a	1.11c	22.25	120.35a	12.62b	10.74c	21.46	4.73a	5.63c	10.35b	45.59a
S_3	8.46b	2.45ab	22.46	97.10c	13.44b	13.36b	22.88	4.54b	6.23a	10.77a	42.07c
S_4	7.74c	2.20b	22.93	87.48d	17.22a	17.14a	21.18	3.27d	5.99b	9.26d	34.76d
CV (%)	6.24	5.23	5.63	7.48	7.25	6.25	4.25	3.96	5.82	4.91	4.52
Level of sig.	**	**	NS	**	**	**	NS	**	**	**	**
Weed management											
W_0	5.63d	2.87a	20.97b	66.33d	23.40a	25.85a	20.90	3.13e	5.32d	8.45d	36.51c
W_1	8.00c	1.90b	22.46a	93.48c	14.47b	13.95b	21.46	4.02d	5.68c	9.70c	41.31b
W_2	8.41bc	2.03b	22.68a	114.0bc	13.25bc	11.05c	21.73	4.35c	5.87bc	10.22b	42.42b
W_3	10.59a	1.47c	22.33a	130.17a	10.57d	7.53d	21.24	4.91a	6.06ab	10.97a	44.72a
W_4	8.71b	2.13b	23.08a	119.55b	13.03c	10.02c	21.59	4.54b	6.25a	10.80a	42.04b
CV (%)	6.24	5.23	5.63	7.48	7.25	6.25	4.25	3.96	5.82	4.91	4.52
Level of sig.	**	**	**	**	**	**	NS	**	**	**	**

Mean values in a column having the same letter(s) do not differ significantly whereas mean values having different letter(s) differ significantly as per DMRT
**= Significant at 1% level of probability, NS= Not significant, CV= Co-efficient of variance
S_1 = 25cm × 10cm, S_2 = 25cm × 15cm, S_3 = 25cm × 20cm, S_4 = 20cm × 10cm
W_0 = No weeding (control), W_1 = One hand weeding at 20 DAT, W_2 = Two hand weedings at 20 and 35 DAT, W_3 = Three hand weedings at 20, 35 and 50 DAT, W_4 = Pyrazosulfuron-ethyl 10 WP

Table 2. Interaction effect of spacing and weed management on the yield and yield contributing characters of T. *Aman* rice cv. BRRI dhan56 at harvest

Interaction (S × W)	Number of effective tillers hill^{-1}	Number of non-effective tillers hill^{-1}	Panicle length (cm)	Number of grains panicle^{-1}	Number of sterile spikelets panicle^{-1}	Sterility (%)	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
$S_1 \times W_0$	5.04h	4.29a	20.58	74.24	30.13a	28.85a	19.73	3.05j	5.33e	8.38g	36.37gh
$S_1 \times W_1$	6.21g	1.63e-h	21.36	108.75	15.34def	12.37g	20.05	4.00gh	5.52de	9.51f	42.12cde
$S_1 \times W_2$	7.66ef	2.17c-f	21.65	117.51	12.13gh	9.35hi	20.08	4.31f	5.48de	9.79f	44.01bc
$S_1 \times W_3$	10.47ab	2.03c-f	22.26	142.52	14.57efg	9.28hi	20.22	5.19a	5.45de	10.63cde	48.87a
$S_1 \times W_4$	8.54c-f	2.62bc	22.04	126.42	10.29hi	7.54hij	20.05	4.58e	5.71cde	10.29e	44.53bc
$S_2 \times W_0$	7.64ef	2.03c-f	20.49	67.63	24.64b	26.68b	21.74	3.79h	4.92f	8.74g	43.50bc
$S_2 \times W_1$	8.47c-f	1.03hi	22.48	115.27	10.92h	8.62hi	21.18	4.69de	5.38e	10.06de	46.58ab
$S_2 \times W_2$	9.67bc	1.16ghi	23.29	135.36	7.92ij	5.53jk	21.92	5.01ab	5.57de	10.58bcd	47.37a
$S_2 \times W_3$	11.51a	0.66i	21.85	140.83	6.95j	4.70k	21.49	5.35a	5.91bcd	11.26ab	47.51a
$S_2 \times W_4$	9.16cd	0.68i	23.15	142.67	12.65fgh	8.14hi	20.98	4.79cde	6.36ab	11.15ab	42.99bc
$S_3 \times W_0$	4.79h	2.54bcd	21.09	62.23	19.57c	23.92c	22.07	3.77h	5.60de	9.37f	40.26ef
$S_3 \times W_1$	8.93cd	2.51cd	22.65	73.27	15.60de	17.57e	23.13	4.29f	6.32ab	10.61cde	40.39def
$S_3 \times W_2$	8.76c-f	2.15c-f	22.70	120.11	10.65hi	8.14hii	23.41	4.72de	6.31ab	11.03abc	42.82bcd
$S_3 \times W_3$	10.97a	1.75d-h	22.22	123.66	9.92hi	7.43ij	22.18	5.04ab	6.34ab	11.38a	44.31bc
$S_3 \times W_4$	8.87cde	3.31b	23.62	106.23	11.47h	9.74f	23.59	4.88bcd	6.58a	11.46a	42.55cde
$S_4 \times W_0$	5.05h	2.62bc	21.73	61.24	19.26c	6.25jk	20.07	1.90k	5.43e	7.33h	25.91i
$S_4 \times W_1$	8.41def	2.42cde	23.35	76.61	16.01de	17.22ef	21.48	3.11j	5.50de	8.61g	36.14gh
$S_4 \times W_2$	7.55f	2.62bc	23.07	83.02	22.31b	21.18cde	21.53	3.36i	6.12abc	9.48f	35.48h
$S_4 \times W_3$	9.40bcd	1.44fgh	23.00	113.66	10.83h	8.70hi	21.07	4.04g	6.55a	10.59cde	38.18fg
$S_4 \times W_4$	8.27def	1.89c-g	23.52	102.88	17.69cd	14.66fgh	21.74	3.92gh	6.37ab	10.28e	38.09fg
CV (%)	6.24	5.23	5.63	7.48	7.25	7.97	4.25	3.96	5.82	4.91	4.52
Level of sig.	**	**	NS	NS	*	**	NS	**	**	**	**

Mean values in a column having the same letter(s) do not differ significantly whereas mean values having different letter(s) differ significantly as per DMRT

**= Significant at 1% level of probability, *= Significant at 5% level of probability, NS= Not significant, CV= Co-efficient of variance

S_1 = 25cm × 10cm, S_2 = 25cm × 15cm, S_3 = 25cm × 20cm, S_4 = 20cm × 10cm

W_0 = No weeding (control), W_1 = One hand weeding at 20 DAT, W_2 = Two hand weedings at 20 and 35 DAT, W_3 = Three hand weedings at 20, 35 and 50 DAT, W_4 = Pyrazosulfuron-ethyl 10 WP

Effect of spacing on weed plant population and weed dry weight

Spacing had significant effect on the dry weight of weeds except weed plant population (Table 3). The highest weed plant population (14.33 m^{-2}) and weed dry weight (6.14 g m^{-2}) was observed in the closest spacing 20 cm × 10 cm and the lowest weed plant population (11.00 m^{-2}) was observed in the spacing 25 cm × 10 cm. The lowest weed dry weight (5.75 g m^{-2}) was observed in the spacing 25 cm × 20 cm.

Effect of weed management on weed plant population and weed dry weight

Weed management had significant effect on weed plant population and weed dry weight (Table 3). The highest weed plant population (23.17 m^{-2}) and weed dry weight (10.69g) was observed in control condition and the lowest weed plant population (4.33 m^{-2}), weed dry weight (2.83 g) was observed at three hand weedings treatment at 20, 35 and 50 DAT. A similar result was found by Parvez *et al.* (2013). They reported that The highest weed population and weed dry weight was observed in no weeding and the lowest weed population and weed dry weight were observed in weed free treatment.

Effect of interaction between spacing and weed management

The interaction effect between plant spacing and weed management was significant on weed plant population and dry weight of weeds (Table 4). The highest weed plant population (29.33 m^{-2}) was observed in closest spacing 20 cm × 10 cm with control treatment. The lowest one was found in 25 cm × 15 cm spacing with herbicidal weed control by 'Manage 10WP' treatment. The highest weed dry weight (12.16g) was observed in the closest spacing 20 cm × 10 cm with control treatment. The lowest one (2.53g) was found in 20 cm × 10 cm spacing with herbicidal weed control by pyrazosulfuron-ethyl 10 WP, which was statistically identical to other two spacings 25 cm × 15 cm and 25 cm × 20 cm with herbicide pyrazosulfuron-ethyl 10 WP application.

Table 3. Effect of spacing on the weed population and weed dry weight of T. *Aman* rice cv. BRRI dhan56 at 65 DAT

Spacing	**Weed Plant population (m^{-2})**	**Dry weight (g m^{-2})**
S_1	11.00	5.95b
S_2	11.53	5.93b
S_3	11.67	5.75b
S_4	14.33	6.14a
CV (%)	5.78	6.97
Level of sig.	NS	**
Weed management		
W_0	23.17a	10.69a
W_1	14.42b	6.60b
W_2	12.00c	5.76c
W_3	4.33e	2.83e
W_4	6.75d	3.83d
CV (%)	5.78	6.97
Level of sig.	**	**

Mean values in a column having the same letter(s) do not differ significantly whereas mean values having different letter(s) differ significantly as per DMRT

**= Significant at 1% level of probability, NS= Not significant, CV= Co-efficient of variance

S_1 = 25cm × 10cm, S_2 = 25cm × 15cm, S_3 = 25cm × 20cm, S_4 = 20cm × 10cm. W_0 = No weeding (control), W_1 = One hand weeding at 20 DAT, W_2 = Two hand weedings at 20 and 35 DAT, W_3 = Three hand weedings at 20, 35 and 50 DAT, W_4 = Pyrazosulfuron-ethyl 10 WP

Table 4. Interaction effect of spacing and weed management on the weed population and weed dry weight of T. *Aman* rice cv. BRRI dhan56 at 65 DAT

Interaction (S × W)	Weed Plant population (m^{-2})	Dry weight (g m^{-2})
$S_1 \times W_0$	18.67d	9.04c
$S_1 \times W_1$	13.67fg	6.11d
$S_1 \times W_2$	10.67h	6.87d
$S_1 \times W_3$	7.67i	4.30e
$S_1 \times W_4$	4.33jk	3.43ef
$S_2 \times W_0$	20.67c	10.86b
$S_2 \times W_1$	15.67ef	8.50c
$S_2 \times W_2$	12.33gh	3.80ef
$S_2 \times W_3$	6.00ij	3.92ef
$S_2 \times W_4$	3.00k	2.56f
$S_3 \times W_0$	24.00b	10.70b
$S_3 \times W_1$	12.33gh	5.89d
$S_3 \times W_2$	11.00h	6.68d
$S_3 \times W_3$	6.00ij	3.20ef
$S_3 \times W_4$	5.00jk	2.77f
$S_4 \times W_0$	29.33a	12.16a
$S_4 \times W_1$	16.00i	5.89d
$S_4 \times W_2$	14.00efg	5.69d
$S_4 \times W_3$	7.33i	3.90ef
$S_4 \times W_4$	5.00jk	2.53f
CV (%)	5.78	6.97
Level of sig.	**	**

Mean values in a column having the same letter(s) do not differ significantly whereas mean values having different letter(s) differ significantly as per DMRT

**= Significant at 1% level of probability, CV= Co-efficient of variance

S_1 = 25cm × 10cm, S_2 = 25cm × 15cm, S_3 = 25cm × 20cm, S_4 = 20cm × 10cm

W_0 = No weeding (control), W_1 = One hand weeding at 20 DAT, W_2 = Two hand weedings at 20 and 35 DAT, W_3 = Three hand weedings at 20, 35 and 50 DAT, W_4 = Pyrazosulfuron-ethyl 10 WP

Relationship between total dry matter and grain yield

Relationship between grain yield and total dry matter has been shown in (Fig. 1). Total dry matter is an important character responsible for higher grain yield. Experimental results revealed that the grain yield showed significantly positive correlation (R^2 = 0.459**) with total dry matter at 65 DAT. This means an increase in total dry matter resulted in the corresponding increase in the grain yield of transplant *Aman* rice. Thus total dry matter might be critical characteristics in yield performance of transplant *Aman* rice.

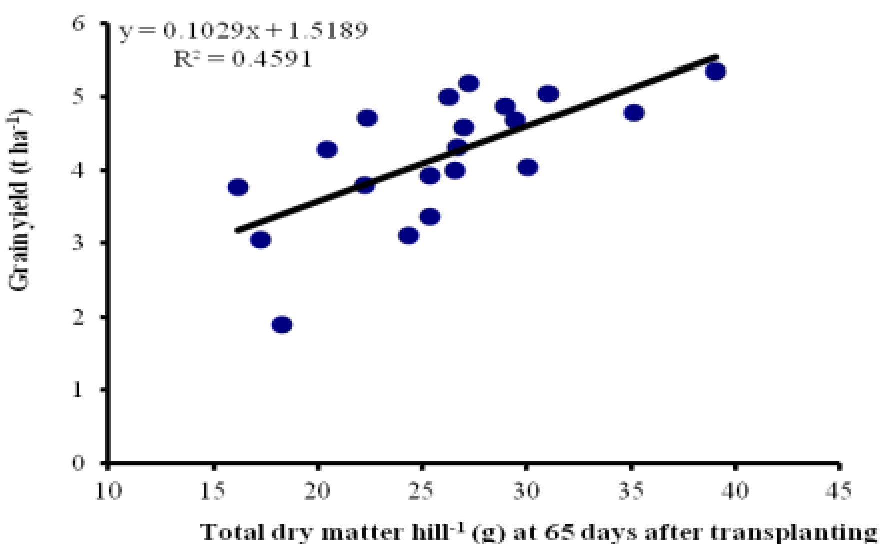

Fig. 1. Relationship between total dry matter hill^{-1}(g) at 65 days after transplanting and grain yield of T. *Aman* rice cv. BRRI dhan56

Relationship between weed dry weight and grain yield

Relationship between grain yield and weed dry weight has been shown in (Fig. 2). Experimental results revealed that the grain yield showed significantly negative correlation (R^2 = 0.430**) with weed dry weight at 65 DAT. This means increase in weed dry weight resulted in the corresponding decrease in the grain yield of transplant *Aman* rice. Thus weed dry weight might be critical characteristics in yield performance of transplant *Aman* rice.

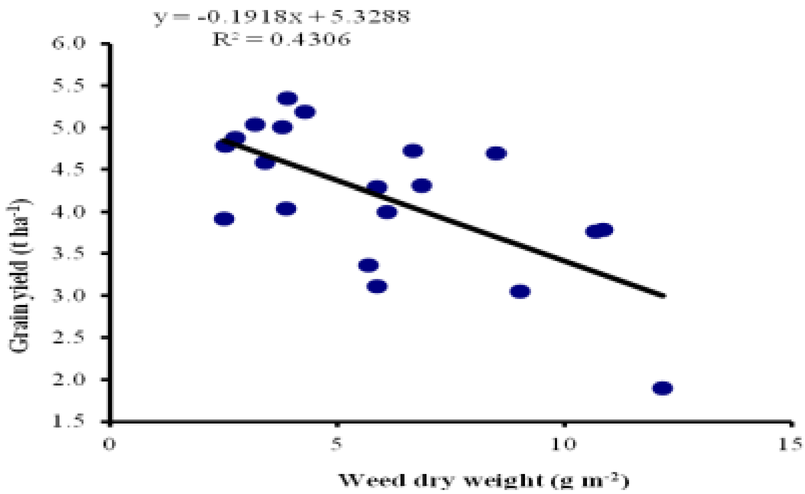

Fig. 2. Relationship between weed dry weight (g m^{-2}) at 65 DAT and grain yield of T. *Aman* rice cv. BRRI dhan56

CONCLUSION

Results revealed that proper spacing and weed management options play an important role in increasing yield of rice. Optimum spacing provides sufficient nutrients and moisture for proper growth and development of crop. On the other hand, proper weed management reduces weed infestation and maximum rice yield. Therefore, it may be concluded that 25 cm × 15 cm spacing with three hand weedings at 20, 35 and 50 DAT appeared as the best combination to obtain maximum grain yield of T. *Aman* rice cv. BRRI dhan56.

REFERENCES

Ahmed GJU, Bhuiyan MKA, Riches CR, Mortimer M, Jhonson D (2005) Farmer' participatory studies of integrated weed management system for intensified lowland. Proceeding of the 8th Biennial Agronomy Convention, Bangladesh Agron. Soc., Dhaka.

AIS (Agricultural Information Service) (2011) Krishi Diary. Agril. Inf. Ser. Dhaka. pp. 20-22.

Alam MS, Baki MA, Sultana MS, Ali KJ, Islam MS (2012) Effect of variety, spacing and number of seedlings per hill on the yield potentials of transplant aman rice. *Int. J. Agron. Agric. Res*., 2(12), 2223-7054.

Baloch AW, Soomro AM, Javed MA, Ahmed M (2002) Optimum plant density for high yield in rice. *Asian J. Plant Sci*., 1, 25-27.

BBS (Bangladesh Bureau of Statistics) (2011) Statistical Year Book of Bangladesh. Bur., Stat Div., Minist. Plan. Govt. People's Repub. Bangladesh, Dhaka. pp. 47-50.

BRRI (Bangladesh Rice Research Institute) (2008) Annual Report for 2007. Bangladesh Rice Res Inst., Joydevpur, Bangladesh, pp. 28-35.

Gomez KA, Gomez AA (1984) Duncun's, Multiple Range Test. Statistical Procedures for Agril. Res. 2nd Edn. A Wiley Inter-Science Publication, John Wiley and Sons, New York. pp. 202-215.

Hossain SMA (2006) Personal communication. Professor, Dept. of Agronomy, Bangladesh Agricultural University, Mymensingh.

Islam MA (2001) Evaluation of four herbicides in controlling weeds in transplanted *Aman* rice. MS Thesis, Dept. Agron., *Bangladesh Agril. Univ*., pp. 35-64.

Khan MB, Yasir TA, Aman M (2005) Growth and yield comparison of different linseed genotypes planted at different row spacing. *Int. J. Agric. Biol*., 7, 515-517.

Mamun AA (1988) Crop-ecosystem weed vegetation and weed management in Dakshin Chamuria and Jawar. Proceedings of the Mid-Term Review Workshop of JSARD, Jan. 24, JICA Gulshan, Dhaka, Bangladesh, pp: 316-342.

Mandol MAH, Rahman MA, Gaffar MA (1995) Field efficacy of Rilof H and Rifit herbicides for weed control in transplanted *aman* rice (BRI1). *Bangladesh J. Agric*. 19(20), 7-12.

Mitra BK, Karim, AJMS, Haque MM, Ahmed GJU, Bari MN (2005) Effect of weed management practices on transplanted *aman* rice. *J. Agron*. 4, 238-241.

Nandal DP, Singh CM (1994) Effect of weed control on direct seeded puddled rice. *Haryana Agril. Univ. J. Res.* 24(4), 154-157.

Oad FC, Solangi BK, Samo MA, Kakho AA, Hassan ZU, Oad NL (2001) Growth, yield and relationship of rapeseed under different rowspacing. *Int. J. Agric. Biol*., 3, 475-476.

Parvez MS, Salam MA, Kato-Noguchi H, Begum M (2013) Effect of cultivar and weeding regime on the performance of transplant aman rice. *Int. J. Agric. Crop Sci*., pp: 654-666.

Rahman SM (2001) Effect of herbicides on the growth and yields of *aus* rice cv. Iratom-24. Unpublished Thesis. Bangladesh Agricultural University, Mymensingh. pp. 45-66.

UNDP, FAO (1998) Land Resource Appraisal of Bangladesh for Agricultural Development Report No.2. Agro-ecological Regions of Bangladesh. United Nations Development Programme and Food and Agriculture Organization. pp. 212-221.