BANGLADESH JOURNAL OF PROGRESSIVE SCIENCE & TECHNOLOGY BJPST

BJPST: 11(1): 107-110 [January, 2013] ISSN: 2305-1809 (Online version)

Available online at *http:/www.bjpst.net*

EFFECT OF STORAGE CONDITION AND STORAGE DURATION OF UPROOTED SEEDLINGS ON THE PERFORMANCE OF TRANSPLANT AMAN RICE CV. BR11

Hossain MS[1], Zaman F, Hossain MM[2] and Hasan AK

Dept. Agron, Bangladesh Agricultural University, Mymensingh, Bangladesh

[1]Assist. Manager (Production), Supreme Seed Company Limited

[2]Agron. Div., Bangladesh Sugarcane Research Institute, Pabna, Bangladesh

ABSTRACT

An experiment was conducted at Mymensingh during the period from July to November 2010 to find out the effect of storage condition and storage duration of uprooted seedlings cv. BR 11 on the performance of transplant *aman* rice. Three storage condition of uprooted BR11 rice seedlings viz. under shade, in the sun and in water and five storage duration viz. 0, 2, 4, 6 and 8 days were included in the experiment. The experiment was laid out in a Split-plot design with three replications. Result indicates that the best performance was exhibited by the seedlings stored in water followed by those stored under shade and in the sun. The effect of storage period is also significant. Result revealed that among the storage duration of uprooted rice seedlings, 0 days storage duration showed best performance in respect of plant height (cm), panicle length (cm), number of fertile tillers per hill^{-1}, number of filled grain hill^{-1}, 1000-grain weight (g), grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}), harvest index (%). The interaction of storage condition and storage duration significantly affected on number of hills plant^{-1}, number of culms m^{-2}, plant height, number of filled grain hill^{-1}, grain yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index. In general the effect of interaction was in favour of water storage and 0 days storage duration.

Key words: *Storage condition, storage duration, uprooted seedlings*

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important cereal crop in Bangladesh. The total area and production of rice in Bangladesh are 11.35 million hectares and 31.975 million tons, respectively (BBS, 2010). It is grown in Bangladesh under diverse ecosystems of irrigated, rain-fed and deepwater condition in three distinct seasons namely**,** *aus, aman* and *boro* (Rashid, 1994). Among these three seasons the production of *aman rice* in Bangladesh was 12.2 million tons (BBS, 2010). Although rice is being extensively cultivated in Bangladesh, the yield is much lower, only 2.48 t ha^{-1} in comparison with that of the other developing countries like South Korea and Japan with the yield of 6.01 t ha^{-1} and 6.18 t ha^{-1}, respectively (FAO, 1995). However, the full genetic potentiality may not be achieved due to various environmental and socio-economic conditions.

The Bangladesh agriculture is prone to numerous risks and hazards like drought, excessive rainfall, storm, flood and so on. Due to unexpected incessant rainfall or flash flood during the transplant *aman* season, most of the cultivated lands, especially the low lying are goes under water causing severe damage to the rice seedlings in the nursery beds as well as in the freshly transplanted fields. As a result, an acute shortage of rice seedlings occurs very frequently when the flood water recedes. Under such situations, the rice seedlings may be saved by uprooting them from the nursery beds at the advent of flood, and stored in a suitable place for same times so that those can be transplanted after recession of flood water.

Gomosta *et al.* (1990) evaluated the performance of uprooted rice seedlings stored in water and in mud for a number of days. The observed that 20 and 40 day old seedlings of BR11 rice, transplanted after 1 to 4 weeks of storage in mud, showed 85% survivability irrespective of age of seedlings. The survivability percentage decreased with the increase in storage duration in case of water storage. In some cases the grain yield became even nil when the seedlings were stored in water for 3 to 4 weeks, whereas it varied from 2.8 to 3.5 t/ha in case of mud storage of seedlings. They concluded that to obtain a reasonable grain yield, uprooted seedlings of transplant *aman* rice might be stored in mud up to 4 weeks irrespective of seeding age ranging from 20 to 40 days and 40-day-old seedlings in water up to 1 week.

Sometimes, it is seen that due to scarcity of good seeds or some other reasons farmers cannot produce rice seedlings up to their requirements. So, they had to purchase seedlings from the far away market places wasting a considerable period of time from uprooting to transplanting of rice seedlings in the field.

Uprooted rice seedlings are found to be preserved under various conditions such as in water, in the sun, in mud and under shade and so on. Sometimes, seedlings are transported keeping them in bundles inside the gunny bags. It is expected that the viability and strength of uprooted rice seedlings may be adversely affected in different manners under variable conditions of preservation. It is not yet clearly known how and how long the uprooted rice seedlings may be preserved without deteriorating their qualities and vigour.

The present study was, therefore, undertaken to determine this effect of storage conditions and storage durations of uprooted seedlings cv. BR11 on the performance of transplant *aman* rice.

MATERIALS AND METHODS

An experiment was conducted at Mymensingh during the period from July to November 2010. The land was medium high and the soil was sandy-loam and well drained and its general fertility level was low. The soil of the experimental field was more or less neutral in reaction with p^H value 5.6 to 7.3 and low in organic matter content (1.67%). The experiment consisted of three storage condition viz. under shade (E_1), in the sun (E_2) and in water (E_3) and five storage duration viz. 0 days (D_0), 2 days (D_1), 4 days (D_2), 6 days (D_3) and 8 days (D_4).

The experiment was laid out in split-plot design, assigning the storage condition to the main plot and storage duration to the subplots at random. The treatments were replicated 4 times. The recommended rice cultivar, BR11 (Mukta), was used as planting material. The seedlings were raised in the wet nursery beds. The sprouted rice was sown in the nursery bed on 4 July 2010. The crop was fertilized with urea, triple superphosphate, muriate of potash, gypsum and zinc sulphate at the rates of 150, 90, 40, 60 and 10 kg ha^{-1}, respectively as per recommendation of (BRRI, 1995). The full dose of triple superphosphate, muriate of potash, gypsum and zinc sulphate and one third of urea were applied at the time of final land preparation. The rest of urea was top-dressed in two equal splits on 42 and 64 days after transplanting, which coincided with the maximum tillering and Panicle initiation stages, respectively. The seedlings were uprooted carefully from the nursery bed on 10, 12, 14, 16 and 18 August 2010 and stored for 8, 6, 4, 2 and 0 days, respectively as per design of the experiment. Transplanting was done on 18 August using 44 day old seedlings at the rate 3 seedlings per hill by maintaining the spacing of 25 cm and 15 cm between the rows and hills, respectively. Identical intercultural operations were done in each unit plot as a when required. Weeding was done twice with the help of sickle on 20 and 35 days of transplanting. Two irrigations were given on 34 and 56 days of transplanting. The crop was harvested plot wise on 25 November 2010 at full maturity. Number of hills $plot^{-1}$ and number of culms m^{-2} were counted at harvest. Data were collected on number of hills $plot^{-1}$, number of culms m^{-2}, plant height, number of fertile tillers $hill^{-1}$, number of infertile tillers $hill^{-1}$, 1000-grain weight, grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index (%). Collected data were analyzed statistically using MSTAT-C program and the means were compared by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Effect of storage condition

The storage condition had significant effect on number of hills $plant^{-1}$, number of culms m^{-2}, plant height, number of fertile tillers $hill^{-1}$, number of filled grain $hill^{-1}$, 1000–grain weight, straw yield (t ha^{-1}) and harvest index (%). Among the three storage condition the highest number of hills $plant^{-1}$ (259.4) was noted when the seedling stored in water (Table 1). The seedlings stored in water produced the highest number of culms m^{-2} (246.1), while the lowest number (214.1) was obtained from seedlings stored in the sun (Table 1). The maximum plant height (cm), number of fertile tillers $hill^{-1}$ and number of filled grain were produced when the seedlings stored in water and it was produced significantly higher than those produced by the seedlings stored either under shade or in the sun. The number of infertile tillers $hill^{-1}$ and unfilled grains $hill^{-1}$ produced by the seedlings under different storage conditions failed to show any significant difference (Table 1). Grain yield was also not significantly affected by the condition of storage viz. under shade, in the sun and in water. Here the highest weight of 1000-grain (104.4 g) and the highest straw yield (9.12 t ha^{-1}) were produced when the seedlings stored in water. Biological yield do not show any significant difference under different storage condition of seedlings. The maximum value of harvest index (686.4%) was exhibited by the seedlings stored in water (Table 1).

Effect of storage duration

Storage duration showed significant variation on number of hills $plant^{-1}$, number of culms m^{-2}, plant height, panicle length (cm), number of fertile tillers $hill^{-1}$, number of filled grains $hill^{-1}$, 1000-grain weight, grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index (%) but insignificant variation on number of unfilled grains $hill^{-1}$ (Table 1). The height number of hills $plant^{-1}$, number of culms m^{-2}, plant height, panicle length (cm), number of fertile tillers $hill^{-1}$, number of filled grain $hill^{-1}$, 1000–grain weight, grain yield (t ha^{-1}), straw yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index (%) were obtained from the seedlings stored for 0 day, which was identical to that of 2 days of storage (Table 1). A decreasing trend in all the parameters was observed with the increasing the storage durations. Similar findings were also published by Karim (2007) who reported that panicle length and thousand grain weight did not show any significant variation due to variation of storage durations of uprooted rice seedlings.

Effect of interaction of storage condition and storage duration

The interaction effect of storage condition and storage condition and storage duration showed significant variation for number of hills $plant^{-1}$, number of culms m^{-2}, plant height, number of filled grain $hill^{-1}$, grain yield (t ha^{-1}), biological yield (t ha^{-1}) and harvest index (Table 2). The maximum number of hills $plant^{-1}$ (267.3) was noted in the treatment where the seedling was stored in water for 0 day. Gomosta *et al.* (1990) evaluated the performance of uprooted rice seedlings stored in water and in mud for a number of days. They found that the survivability percentages decreased with the increase in storage duration in the case of water storage. The results

obtained from the study are partial agreement with those of Gomosta *et al.* (1990). The maximum number of culms m^{-2} (253.8) and plant height (105.7 cm) were obtained from the seedling was stored in water for 0 day. Panicle length (cm), number of fertile tillers $hill^{-1}$, 1000- grain weight and straw yield (t ha^{-1}) did not show any significant effect due to interaction of storage condition and storage duration (Table 2). The effect of interaction of storage condition and storage duration was significant on grain yield (t ha^{-1}) and biological yield (t ha^{-1}). The grain yield (t ha^{-1}) was significantly higher in plants stored in water an all the storage duration from 0 to 8 days. The reason for the higher grain yield in the above mention treatment combinations might be due to the favorable cumulative effect of the yield contributing characters such as number of hills $plot^{-1}$ and number of culms m^{-2}. The seedlings stored in water might have got a comparatively more favorable environment than the other conditions of storage under shade and in the sun to continue their normal physiological activities even for considerably longer durations of 8 days. The effect of interaction of storage condition and storage duration was significant on harvest index (Table 2).

Result revealed that, in case of an emergency, uprooted seedlings of BR11 rice can be stored in water even up to 8 days and in the sun or under shade for 0 to 2 days without any considerable losses in grain yields.

Table 1. Effect of storage conditions and storage duration of uprooted seedlings on the studied crop characters of transplant aman rice cv. BR11

Treatment	Hills $plot^{-1}$ (no.)	Culms m^{-2} (no.)	Plant height (cm)	Panicle length (cm)	Fertile Tillers $hill^{-1}$ (no.	Filled grains $hill^{-1}$ (no.)	1000–grain weight (g)	Grain Yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
Storage condition											
Shade (E_1)	245.3 b*	227.8 b	100.3 b	20.60	8.30 b	641.7 b	100.3 b	20.60	8.30 b	5.78	641.7 b
Sun (E_2)	234.8 c	214.1 c	97.98 c	20.58	7.70 b	599.5 c	97.98 c	20.58	7.70 b	5.29	599.5 c
Water (E_3)	259.4 a	246.1 a	104.4 a	20.37	9.12 a	686.4 a	104.4 a	20.37	9.12 a	5.75	686.4 a
LS	0.01	0.01	0.01	NS	0.01	0.01	0.01	NS	0.01	NS	0.01
Storage Duration											
0 (D_1)	265.5 a*	252.7 a	104.0 a	21.17 a	9.68 a	743.2 a	104.0 a	21.17 a	9.68 a	6.73 a	743.2 a
2 (D_2)	258.8 a	241.1 b	102.5 b	20.93ab	8.98 b	688.4 b	102.5 b	20.93 ab	8.98 b	6.07 b	688.4 b
4 (D_3)	247.9 b	230.8 c	101.5 b	20.57bc	8.40 c	636.3 c	101.5 b	20.57 bc	8.40 c	5.58 bc	636.3 c
6 (D_4)	236.0 c	222.3 d	99.3 c	20.24 c	7.76 d	600.8 d	99.3 c	20.24 c	7.76 d	5.08 cd	600.8 d
8 (D_5)	224.2 d	199.9 c	99.4 d	19.71 d	7.05 e	544.1 c	99.4 d	19.71 d	7.05e	4.56 d	544.1 c
LS	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

** In a column, the treatment means having common letter(s) do not differ significantly*

E_1 = Shade, D_0 = 0 day D_3 = 6 days; E_2 = Sun, D_1 = 2 daysD_4 = 8 days; E_3 = Water, D_2 = 4 days

Table 2. Effect of interaction of storage conditions and storage durations of uprooted seedlings on the studied crop characters of transplant *aman rice* cv. BR 11

Storage condition	Hills $plot^{-1}$ (no.)	Culms m^{-2} (no.)	Plant height (cm)	Panicle length (cm)	Fertile Tillers $hill^{-1}$ (no.	Filled grains $hill^{-1}$ (no.)	1000–grain weight (g)	Grain Yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
$E_1 \times D_0$	266.0 a*	251.5 a	103.5abc	21.22	9.40	749.0 a	23.76	4.87 a	6.24	11.11ab	43.85 c
$E_1 \times D_1$	256.8ab	242.0abc	102.1cde	22.10	8.65	698.4bc	22.74	4.66bc	5.81	10.47cd	44.53bc
$E_1 \times D_2$	250.8b	228.0 de	100.2d-g	20.75	8.25	642.7 de	22.74	4.64 c	5.83	10.47cd	44.3 bc
$E_1 \times D_3$	231.3cd	222.0 d	98.26fg	20.11	7.95	585.7 f	22.53	4.10 d	5.13	9.23 e	44.45bc
$E_1 \times D_4$	221.5cd	195.5 f	97.56 g	19.81	7.25	532.8 g	22.21	3.95 e	5.04	8.99ef	43.97bc
$E_2 \times D_0$	263.3ab	252.8 a	102.7bcd	20.96	9.25	731.2 ab	23.49	4.93 a	6.10	11.02abc	44.69bc
$E_2 \times D_1$	258.8ab	231.5 d	100.7 def	20.99	8.60	662.0cde	22.11	4.80 ab	5.76	10.56bc	45.50bc
$E_2 \times D_2$	234.3c	219.5 e	99.65efg	21.04	7.60	588.7 f	22.21	4.04 b	5.33	9.37 e	43.14 c
$E_2 \times D_3$	219.3d	201.8 f	94.37 h	20.38	6.83	537.5 g	22.21	3.77 f	4.8	8.63 f	43.62 c
$E_2 \times D_4$	198.3c	164.8 g	92.48 h	19.57	6.23	478.3 h	21.48	3.71 f	4.84	8.54 f	43.38 c
$E_3 \times D_0$	267.3a	253.8 a	105.7 a	21.30	10.37	479.3 a	23.56	4.95 a	6.24	11.19 a	44.2bc
$E_3 \times D_1$	260.8ab	249.8 ab	104.8abc	20.70	9.68	704.8abc	22.70	4.94 a	6.06	10.99abc	44.90bc
$E_3 \times D_2$	258.8ab	244.8ab	104.6abc	19.92	9.35	677.7cd	22.68	4.90 a	5.94	10.84abc	45.23bc
$E_3 \times D_3$	257.5ab	243.0ab	105.1ab	20.22	8.50	679.2cd	22.33	4.92 a	5.72	10.64abc	46.2 ab
$E_3 \times D_4$	252.8ab	239.5bc	102.1cde	19.74	7.68	621.2ef	22.13	4.80 ab	4.16	9.96 d	48.30 a
LS	0.01	0.01	0.01	NS	NS	0.01	NS	0.01	NS	0.01	0.01

** In a column, the treatment means having common letter(s) do not differ significantly*

E_1 = Shade, D_0 = 0 day D_3 = 6 days; E_2 = Sun, D_1 = 2 daysD_4 = 8 days; E_3 = Water, D_2 = 4 days

REFERENCES

BBS (Bangladesh Bureau of Statistics). 2010. Statistical Yearbook of Bangladesh. Bangladesh Bur. Stat., Stat. Div., Minis. Plann., Govt. People's Repub. Bangladesh. Dhaka. p. 47-49.

BRRI. 1991. The annual Report for 1988. Bangladesh Rice Res. Inst. Joydebpur, Gazipur.p.74-77.

BRRI. 1995. Adhunik Dhaner Chash (in Bangali). Bangladesh Rice Res. Inst. Joydebpur, Gazipur, pp.140.

FAO (Food and Agriculture Organization). 1995. *Production Year Book* FAO, UN, Rome, 49:70-71.

Gomez KA and Gomez AA. 1984. Statistical Producers for Agricultural Research. A Wiley Int. Sci. Pub. John Wiley and Sons, New York, Brisbane, Singapore. pp.139-240.

Gomosta AR, Quayyum HA, Mola AH and Haque MZ. 1990. Storage of seedlings for transplant aman rice. Bangladesh Rice Journal 1(1): 55-63.

Karim SMR. 2007. Effect of pre-transplant storage conditions and durations of uprooted seedlings on the performance of aromatic rice. M.S. *Thesis*. Dept. Agron., Sher-e-Bangla Agril. Univ.,Dhaka. pp. 25-55.

Rashid MM. 1994. Rice Production in Bangaldesh - Programme Achievements, Potentials and Challenges, IRCN. 43: 9-18.