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Suitable Transplanting Time for the Modern T. Aman Rice Varieties in Tidal Nonsaline Wetland Situation of Bangladesh

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Abstract: The experiment was conducted to findout the transplanting effects on growth and yield of five modern varieties and to identify suitable varieties for late T. Aman season during 2000 and 2001. The varieties used were BR23 and BRRI dhan33, BRRI dhan37, 38 and 39. Results showed that the planting rice in the month of August was found to be very much risky due to tidal water pressure which mostly led to total crop damage. Early September was the suitable transplanting time of modern varieties for higher grain yield. The results indicated that the varieties like BR23, BRRI dhan 37 and 38 could easily be transplanted up to the 4th week of September with a reasonably higher yield of about 3 t ha^{-1} in the southern region (tidal non-saline area) of Bangladesh.

Key words: Planting time, modern T. Aman varieties, tidal wet land situation, late planting

Introduction

The tidal wetlands represent a major less favourable agro-ecological situation of Bangladesh (Hossain *et al.,* 2002) covering a large area of about 2 M ha of tidal floodplain land in the southern, especially the south-central and south-western regions of the country (Elahi *et al.,* 2001). The northern half of these tidal wetlands is non-saline. The major environmental problem for crop production in tidal wetland situation is twice daily tidal inundation of land, over a period of 5 to 8 months (April to November) of the year with the highest peak normally in August (Panaullah *et al.,* 1993). The magnitude of tide water varies with months of the year and also year to year (Fig. 1). In a specific month, the magnitude of tide water varies also with moon-month, wind speed and direction, air pressure, rainfall etc. In this situation, farmers have to surrender to the vagary of the nature. Sometimes, farmers have to delay the transplanting to avoid crop loss. Sometimes the tide water is so unpredictable and unexpected that the transplanted rice damage just after transplanting and sometimes, even after establishment of the crop (Anonymous, 1995). The tidal water depth during normal transplanting time of T. Aman is usually high, on the other hand, the modern varieties are short statured. Consequently, the adoption of modern varieties in the region is very low as compared to the average of Bangladesh (Anonymous, 1997a; Chakrabarti, 1999). Transplanting of modern varieties in the early T. Aman season is risky, on the other hand there is a few suitable T. Aman varieties for late plantation (Kumar and Jha, 2000). This study was undertaken to determine the appropriate planting time of modern varieties for higher grain yield as well as to find out suitable modern varieties especially for the late season planting with a reasonable higher grain yield during T. Aman season in the nonsaline tidal wetland situation of Bangladesh.

Materials and Methods

The field experiments were conducted at the Bangladesh Rice Research Institute (BRRI), Regional Station, Sagardi farm, Barisal during transplanted Aman (T. Aman) season in the year 2000 and 2001. The experimental field was under non-saline area. Five modern T. Aman varieties; BR23, BRRI dhan33, 37, 38 and 39 were transplanted at about 15 days interval starting from the first week of August and continued up to mid September and beyond that planting interval was about 7 days and continued up to mid October. In the first year, the transplanting dates were Aug. 05 and 15; Sep. 04, 14, 23, 30 and Oct. 7, 14 and in the following year, the dates were Aug. 01 and 15; Sep. 04, 14, 23, 30 and Oct. 7, 14. The results obtained from last planting (14th October) was discarded from the analysis due to abnormal flowering and very poor performance of the crop. Seedlings 30 to 33 day-old were transplanted up to Aug. 30 and after that 45 to 48 day-old seedlings were transplanted with 3 to 5 seedlings $hill^{-1}$ with a spacing of 20 x 20 cm. The scheduled dates of transplanting could not be maintained because of unpredictable and unexpected excess tidal water and stagnation periods in the field. The experiment was laid out in a split plot design with planting dates in the main plots and varieties in the subplots. The unit plot size was 4 x 3 m. The treatments were replicated thrice. The fertilizer rates were 60-40-40-10-4 kg ha^{-1} N-P_2O_5-K_2O-S-Zn, respectively. Fertilizers except

N were applied during final land preparation. Nitrogen was applied as top dress in 3 equal splits. First top dress was applied between 10 and 15 days after transplanting (DAT), second between 30 and 35 DAT and the last at 5 to 7 days before panicle initiation stage. The field was kept insect free by 2-3 times insecticide application and weeding was done to keep the field weed free as and when necessary.

At maturity, the panicle number m^{-2} was calculated from randomly selected 20 hills from each unit plot. Two hills with average panicle number were selected from each unit plot, from these hills grains $panicle^{-1}$ and sterility percentage were calculated. For obtaining grain yield, 5 m^2 area from the centre of each unit plot was harvested. The grain yield was adjusted at 14% moisture content. The collected data were analyzed following standard statistical procedure.

Results and Discussion

Panicle number: The effect of time of planting on panicle production of different modern rice varieties was profound. In the year 2000, panicle numbers were lower in August 1 planting compared to the following transplanting (Fig. 2a, b). In the second year, the August planting was totally damaged due to tidal pressure.

Among the varieties, BRRI dhan 37 and 38 produced comparatively more panicles than those of the other varieties, whereas the variety BR23 produced the least number of panicle irrespective of planting dates. The panicle number from mid September to onward transplanting decreased gradually for all the varieties. In a fluctuating tidal regimes, where damage to young rice seedlings following transplanting is a serious problem, the time of transplanting taking into account the tidal water pressure is critical for the survival, growth and the yield of rice (Panaullah *et al.,* 1993; Anonymous, 1995). In case of August 1 planting, the seedlings were subjected to the longest period of high tidal water pressure that might hampered the vegetative growth of the crop and consequently the panicle number decreased, even the entire crops were damaged in the following year. In the latter plantings from mid September, the panicle number of all the varieties decreased gradually. This was in agreement with Halder *et al.* (1995). These might be due to relatively less time for vegetative phase compared to previous one.

Grain number: The grain number varied significantly among the varieties and also with the planting time. BRRI dhan37 and 38 produced the highest grain number $panicle^{-1}$ among the test varieties followed by BR23 (Table 1, 2). The least number of grains $panicle^{-1}$ was observed in BRRI dhan33. All the test varieties produced more than 100 grains $panicle^{-1}$, when transplanting was

Fig. 1: Day to day tidal water flection from April to November for the year 2001 at BRRI farm Sagardi, Barisal

Table 1: Effect of planting dates on grain number panicle^{-1} of five modern T. Aman varieties, BRRI, R/S Barisal, T. Aman 2000

	Planting dates						
Varieties	05.08	15.08	04.09	14.09	23.09	30.09	07.10
BR23	132	114	105	104	86	70	64
BRRI dhan33	115	102	108	91	83	66	52
BRRI dhan37	112	111	115	116	104	88	97
BRRI dhan38	132	114	102	89	97	87	83
BRRI dhan39	115	106	107	94	104	85	69

LSD $_{(0.05)}$ for column mean 16.93, LSD $_{(0.05)}$ for row mean 16.30

Table 2: Effect of planting dates on grain number panicle^{-1} of five modern T. Aman varieties, BRRI R/S, Barisal, T. Aman 2001

	Planting dates						
Varieties	05.08	15.08	04.09	14.09	23.09	30.09	07.10
BR23	-	111	105	111	101	86	78
BRRI dhan33	-	108	110	95	94	72	59
BRRI dhan37	-	122	118	103	95	86	79
BRRI dhan38	-	123	117	93	105	90	58
BRRI dhan39	-	109	112	107	96	92	67

LSD $_{(0.05)}$ for column mean 14.57, LSD $_{(0.05)}$ for row mean 14.12

Planting dates

Fig. 2: Effect of planting dates on panicle number of five modern T. aman varieties of rice, T. Aman a) 2000 and b) 2002

Fig. 3: Effect of planting dates on grain yield of five modern T. aman varieties of rice, T. aman a) 2000 and b) 2001

done before mid September. The grains panicle^{-1} decreased drastically after September 23 planting. When transplanting was done later than September 30, uneven, poor heading and mostly sterile spikelets were observed. These results are in agreement with Siddique *et al.* (1995). Nishiyama (1976) reported that temperature, apart from day length and solar radiation, plays a vital role in rice plants during later stages of crop growth. He also reported that low temperature during flowering stage affects heading of rice plant. In Barisal region, the night temperature during heading of the later plantation, especially in October was about 18^{0}C that might affects uneven heading of rice.

Grain yield: Variable effects of date of planting on grain yield of different varieties were observed. Among the varieties, BR23 had the highest yield followed by BRRI dhan38 and 37 (Fig. 3a, b). These three varieties were photoperiod sensitive. The other two varieties, BRRI dhan33 and 39 were non-photosensitive and the growth duration was about 120 days. All the varieties produced comparatively higher yield in the early September transplanting. Similar results were obtained from (Anonymous, 1997b, 1999). In the T. Aman season, the high yielding varieties performed well when transplantation was done from mid August to early September. After that the yield reduction was observed in general. In this experiment, the yield of BR23 was also higher in the mid August planting. But early to mid August planting of the short statured BRRI varieties were subject to total crop damage due to tidal water pressure during this period in the tide affected southern region of Bangladesh.

The yield of all the test varieties decreased gradually with the advancement of planting time from mid September to onward. Zaman (1981) and Jhoon (1989) reported that delayed planting reduced vegetative phase resulting reduced yield and yield components. The yield reduction of the varieties BRRI dhan33 and 39 was more pronounced compared to others. The impressive grain yields from BR23, BRRI dhan37 and 38 were obtained from the later transplanting up to the end of September, where about 3 t ha^{-1} grain yield was obtained. This yield was much higher than that of the normal yield obtained from local cultivers (long statured) transplanted in the usual time preferably in August. The average yield of local cultivars in the Barisal region of Bangladesh was 1.55 t ha^{-1} (Anonymous, 2001). In the normal transplanting time, the modern varieties could not be used in the tidal affected area due to its short stature. Earlier BR23 was the only suitable and popular high yielding variety for late plantation in the T. Aman season. In this experiment, it was revealed that in addition to BR23, the modern varieties like BRRI dhan37 and 38, both are fine grain and aromatic rice, might be used as late plantation. Transplanting of modern varieties like BR23, BRRI dhan37 and 38 might be an avenue to adopt modern varieties in the tidal affected area, where the adoption of modern varieties lag far behind the national average.

It is concluded that transplanting in the early September would give higher grain yield, before that there was every possibility of crop damage due to tidal water. For late plantation, the varieties like BR23, BRRI dhan37 and 38 might be used to achieve reasonably good harvest in the tide affected area during T. Aman season. These varieties could be better substitutes of low yielding local cultivars, avoiding the usual difficulties and risks associated with early T. Aman cultivation using modern varieties in the tidal wetland situation of Bangladesh.

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