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Ratooning Ability of Photoperiod-Sensitive Rice Varieties Transplanted in the Boro Season

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Abstract: Field experiment was conducted at the Bangladesh Rice Research Institute, Charbadna farm, Barisal, from boro 2001 to aman 2002. Seven photoperiod-sensitive rice varieties including three fine grain aromatic varieties were transplanted in December 15 and December 30, 2001. After harvest of boro crop the ratoons, came out from the remaining straw and base of the hills, were allowed to grow and in the succeeding aman a good harvest was obtained from those ratoons. In the boro season, the highest yield was obtained from BRRI dhan41 followed by BR23 (7.51 and 7.06 t ha^{-1}, respectively). The yield of aromatic varieties was about 5 t ha^{-1}. The ratoon-yields of both aromatic and non-aromatic varieties in the succeeding aman season were also encouraging and produced about 2 t ha^{-1}, which was more than the average yield of local varieties normally cultivated in the transplanted aman season in that region. The highest yield was obtained from BR23 (2.87 t ha^{-1}) followed by BRRI dhan37 (2.63 t ha^{-1}). From this experiment, it was revealed that the photoperiod-sensitive rice varieties could be planted in the early boro season and the ratoons from this crop also produced a good harvest, might be a low-cost rice cultivation technique in those areas, where crop establishment in the transplanted aman season is somewhat difficult due to early intrusion of tidal water in the field at the end of boro season.

Key words: Ratoon, photoperiod-sensitive, tidal water, boro, aman season

INTRODUCTION

Bangladesh is a land of people and its agriculture is always under threat of different calamities including diminishing cultivable lands. Therefore, there are no other alternatives but to increase production per unit land area to feed the teeming millions. Ratooning, the ability of rice plant to regenerate new tillers after harvest and consequently, grain may be one practical way to increase per unit land productivity. In the southern region of Bangladesh, tidal water is a problem mainly in the low lying areas where often early tidal water intrudes at the end of boro season, frequently affect the harvesting of boro rice crop and also establishment of next transplanted aman crop[1]. Sometimes the tidal water is so unpredictable and unexpected that the damage of the transplanted rice just after transplanting is obvious[2] and consequently the adoption of short statured high yielding rice varieties in this region is very low compared to the average of the country[3,4]. Cultivation of photoperiod-sensitive variety in the early boro season and after harvest of the crop, the ratoons from boro could be a low cost rice cultivation technique and at the same time risk-reducing technique for the succeeding aman season. The present study however, was undertaken to find out the feasibility of ratoon cultivation from the photoperiod-sensitive varieties transplanted in the boro season.

MATERIALS AND METHODS

The experiment was conducted at the Bangladesh Rice Research Institute (BRRI) farm, Charbadna, starting from boro 2001 and continued up to aman season 2002. Seven photoperiod-sensitive rice varieties, BR22, BR23, BRRI dhan34, BRRI dhan37, BRRI dhan38, BRRI dhan40 and BRRI dhan41 were planted in December 15 and December 30, of which BRRI dhan34, BRRI dhan37 and BRRI dhan38 were fine-grained aromatic rice. Forty-five day-old seedlings were transplanted maintaining 20x20 cm spacing. The experiment was laid out in a split plot design with planting time in the main plot and varieties in the sub plot. Each treatment was replicated thrice. Normal crop management practices were done during boro season. After maturity of the boro crop, it was harvested leaving lower 15 cm straw in the field. The new tillers came out from the nodes of the remaining straw and basal portion of the hills were allowed to grow. After 15 days of boro harvest, weeding was done and urea fertilizer @ 40 kg N ha^{-1} was top-dressed. Insecticide was applied two times, first 25 days after boro harvest and the last at 15 days before panicle initiation.

In the boro season, yield data were recorded. In the following aman season plant height, panicle number, thousand-grain weight, sterility percentage and grain yield of the ratoon crop were recorded. The data obtained

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were statistically analyzed by a standard statistical procedure followed by Gomez and Gomez[5].

RESULTS AND DISCUSSION

The yield obtained from different photoperiod-sensitive varieties planted in the boro season was presented in the Fig. 1. Significant yield differences among the tested varieties were observed in both the planting dates. In the first planting, highest yield (7.51 t ha^{-1}) was recorded in BRRI dhan41 followed by BR23 (7.06 t ha^{-1}), whereas it was reverse in the following planting date, 7.17 t ha^{-1} for BR23 and 6.39 t ha^{-1} for BRRI dhan41. The aromatic varieties- BRRI dahan34, BRRI dhan37 and BRRI dhan38 also produced encouraging yield of about 5 t ha^{-1} in both the planting dates. The average yield of these aromatic and non aromatic rice varieties in the aman season is about 3.5 to 4.0 t ha^{-1} and 4.5 to 5.0 t ha^{-1}, respectively[6]. Zaman[7] noted that the photoperiod-sensitive varieties if planted in early boro season could produce higher grain yield than the yield obtained in the aman season. In this experiment, a yield advantage of about 1.5 to 2 t ha^{-1} was obtained when the rice varieties were planted in the boro November 15, otherwise flowering of these varieties would not occur in the boro season. The photoperiod-sensitive rice varieties are short day plant; it initiates panicle primordia in response to short photoperiod[8]. The photoperiod-sensitive varieties should complete its basic vegetative phase before entering into photosensitive phase during which flower initiation can be triggered by the short days[8]. If photoperiod-sensitive varieties are seeded

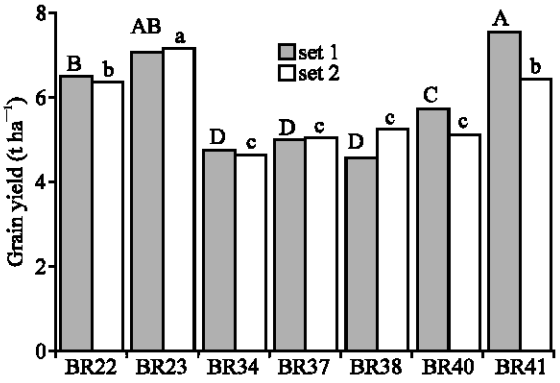

Fig. 1: Grain Yield of photoperiod-sensitive rice varieties transplanted in boro season, BRRI farm Charbadna, Barisal, boro 2001
Yield bar followed by a common letter(s) are not significantly different at 5% level by DMRT, capital letter for 1st planting (set1) and small letter for 2nd planting (set2)

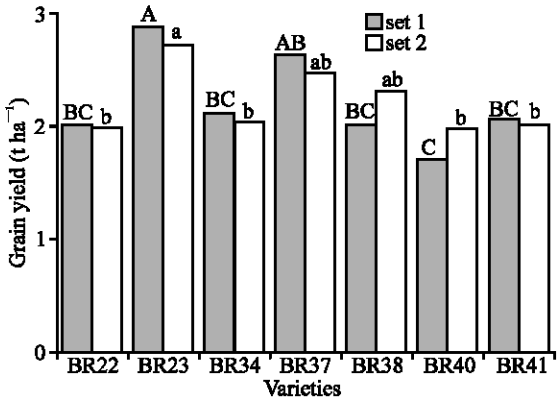

Fig. 2: Grain Yield of ratoon crop obtained from photoperiod-sensitive rice varieties transplanted in boro season, BRRI farm Charbadna, Barisal, aman 2002
Yield bar followed by a common letter(s) are not significantly different at 5% level by DMRT, capital letter for 1st planting (set1) and small letter for 2nd planting (set2)

before November 15, then after completing the basic vegetative phase, it enters into the photoperiod-sensitive phase, during which it initiates panicle primordia in the short day period[8].

In the succeeding aman season, the performance of ratoons was encouraging. The highest yield (2.87 t ha^{-1} in the first planting and 2.70 t ha^{-1} in the second planting) was obtained from BR23 followed by BRRI dhan37 (2.63 t ha^{-1} in the first planting and 2.47 t ha^{-1} in the second planting) and BRRI dhan38 (2.13 t ha^{-1} in the first planting and 2.30 t ha^{-1} in the second planting). The other varieties also yielded about 2 t ha^{-1} grain (Fig 2). The southern region of Bangladesh is dominated by local varieties[9] and the average yield of local varieties in this region was only 1.55 t ha^{-1} [10]. The result obtained from the experiment revealed that if photoperiod sensitive varieties transplanted in early boro season, a comparatively higher yield could be obtained, then the ratoons from this boro crops could be another low cost rice cultivation technique and could produce higher yield compared to the local varieties transplanted normally during the transplanted aman season and at the same time this cultivation technique reduce the risk of crop establishment during aman season.

The plant height among the tested varieties differed significantly. The plant height varied between 112 and 127 cm (Table 1). The highest plant height (127 cm) was observed in BRRI dhan37 followed by BRRI dhan34 (125 cm). It was noted that the aromatic varieties were taller compared to the non-aromatic varieties. The plant height of different varieties did not differ significantly between the planting dates.

Table 1: Performance of ratoon crop obtained from photoperiod-sensitive rice varieties transplanted in boro season, BRRI farm, Charbadna, Barisal, Aman season 2002

	Plant height (cm)			Panicles (no. m^{-2})			Filled grain (no. p^{-1})		
Variety	1st Set	2nd Set	V-Mean	1st Set	2nd Set	V-Mean	1st Set	2nd Set	V-Mean
BR22	116bc	112c	114c	198d	193b	196c	82abc	79ab	81c
BR23	115c	121ab	118bc	204d	197b	201bc	95ab	98a	97ab
BRRI dhan34	125a	124ab	125a	238ab	255a	247a	103a	100a	102a
BRRI dhan37	127a	126a	127a	252a	246a	249a	84abc	88ab	86bc
BRRI dhan38	122ab	123ab	123ab	233abc	246a	240a	71c	81ab	76c
BRRI dhan40	114c	118bc	116c	207cd	215b	211bc	75bc	71b	73c
BRRI dhan41	115c	120ab	118c	217bcd	213b	215b	76bc	82ab	79c
CV (%)	3.2			6.6			14.4		

In a column, means followed by a common letter(s) are not significantly different at 5% level by DMRT

Table 2: Grain yield of photoperiod-sensitive rice varieties transplanted in boro season, BRRI farm Charbadna, Barisal, Boro season 2001

	Planting dates 15.12.2001 (1st Set)	30.12.2001 (2nd Set)
Varieties	V-Mean	
BR22	6.47b	6.32b	6.40
BR23	7.06ab	7.17a	7.11
BRRI dhan34	4.70d	4.62c	4.66
BRRI dhan37	4.98d	5.05c	5.01
BRRI dhan38	4.53d	5.22c	4.88
BRRI dhan40	5.72c	5.08c	5.40
BRRI dhan41	7.51a	6.39b	6.95

In a column, means followed by a common letter(s) are not significantly different at the 5% level by DMRT

Table 3: Grain yield of ratoon crops obtained from photoperiod-sensitive rice varieties transplanted in boro season, BRRI farm Charbadna, Barisal, Aman season 2002

	Planting set		
Varieties	1st Set	2nd Set	V-Mean
BR22	2.01c	1.98b	2.00
BR23	2.87a	2.70a	2.79
BRRI dhan34	2.11bc	2.04b	2.08
BRRI dhan37	2.63ab	2.47ab	2.55
BRRI dhan38	2.00c	2.30ab	2.15
BRRI dhan40	1.69c	1.97b	1.83
BRRI dhan41	2.06bc	2.00b	2.03

In a column, means followed by a common letter(s) are not significantly different at the 5% level by DMRT

The panicle number obtained from unit land area differed significantly among the varieties (Table 1). The highest panicle number (249) was observed in BRRI dhan37, which was statistically insignificant with the panicles obtained from BRRI dhan38 and BRRI dhan34. The lowest panicle number was observed in BR22. The varieties produced identical panicle number in both the planting dates.

The grain number per panicle differed significantly among the tested varieties (Table 1). The range of grain number per panicle varied from 71 to 103. The highest grain number per panicle was observed in BRRI dhan34 (102) followed by BR23 (97). The grain number of the tested varieties obtained from two planting dates did not differ significantly.

In the boro season, BRRI dhan41 produced the highest yield (7.51 t ha^{-1}) followed by BR23 (7.06 t ha^{-1}) among the seven photoperiod-sensitive rice varieties. The yield of aromatic varieties was also high in boro season (about 5.0 t ha^{-1}). The ratoon-yield in the aman season of both aromatic and non-aromatic varieties were encouraging and about 2 t ha^{-1}, more than that of the average yield of the local varieties cultivated normally in the transplanted aman season. The highest yield was obtained from BR23 (2.87 t ha^{-1}) followed by BRRI dhan37 (2.63 t ha^{-1}). From this experiment, it might be concluded that the photoperiod sensitive rice varieties when planted in the early boro season produced more yield and their ratoons also produced a good harvest. Therefore, ratoons from boro crop could be a low-cost cultivation technique in those areas where crop establishment in the aman season would be somewhat difficult due to early intrusion of tidal water in the field ahead of the end of boro season.

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