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PERFORMANCE OF PHOTOPERIOD SENSITIVE RICE PLANTED AT VARIABLE PLANTING DENSITY IN LATE AMAN SEASON

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Abstract

Experiments were conducted at the Bangladesh Rice Research Institute (BRRI) farm, Gazipur to determine the optimum planting density of photoperiod-sensitive rice for late Aman season. Forty-five day old seedling of BR22, BR23 and Nizersail were planted on 21 September in 1989 and on 27 September in 1990 at 25×25 cm, 25×20 cm, 25×15 cm, 20×15 cm, 15×15 cm and 15×10 cm spacing. The number of panicles and grain yield increased with increase of plant density up to 44 hills/m^2 (15×15 cm). The 1000-grain weight remain unaffected over varied plant density.

Key words: Plant density. Photoperiod sensitive, Late aman.

Introduction

Cultivation of transplanted Aman (T. Aman) crop is delayed due to late harvest of Aus rice, late receding of flood water (Zaman, 1986; Gomosta *et al.*, 1989). About 40% of the T. Aman rice is planted in September (Kabir and Miah, 1989). Due to late planting vegetative phase reduced to a great extent and rice plants cannot produce adequate productive tillers resulting in reduced grain yield (Zaman, 1981; BRRI, 1987). This grain yield reduction is higher in photoperiod insensitive varieties compared to photoperiod sensitive rice. To combat this yield reduction in late aman season BRRI released two photoperiod sensitive varieties BR22 and BR23. The grain yield of these two modern varieties are higher than Nizersail even in late planting (Kabir and Miah, 1989).

The yield reduction of late planted rice can be partially compensated by increasing plant population per unit area. Many reports indicated that planting of rice at closer spacing increased number of tillers, panicles and grain yield (De Datta 1981; Verma *et al.*, 1988; BRRI, 1988 and CRRI, 1992). However, the effect of population density on grain yield of these newly released modern rice varieties was not studied under late planting situations. Therefore, the present studies were undertaken to compensate yield loss by increasing plant population per unit area and to determine the optimum plant density of photoperiod sensitive rice for late planting in Aman season.

Materials and Methods

Field experiments were conducted at the BRRI farm, Gazipur, during wet season (T.

Aman). Two modern photoperiod sensitive varieties, BR22 and BR23 and Nizersail, a strongly photoperiod sensitive local improved variety were planted at 25 × 25 cm, 25 × 20 cm, 25 × 15 cm, 20 × 15 cm, 15 × 15 cm and 15 × 10 cm spacing on 21 September 1989 and 27 September 1990. The experimental area was laidout in a split plot design with three replications. Variety was assigned in the main plot and population density in the sub-plot. Unit plot size was 2.5 m × 2.0 m. Forty-five day old seedlings were planted with 2-3 seedlings/hill in both the years. Fertilizers, N,P_2O_5, K_2O and S, were applied @ 30-40-40-10 kg/ha during final land preparation. Rest of the nitrogen (30 kg N/ha) was topdressed at panicle initiation stage. All other cultural practices were done as and when necessary for proper crop management.

The observation on yield components were taken from 12 sample hills in each sub-plot. The sample hills were selected at random excluding two boarder rows. Grain yield was recorded from 5m^2 area and weight was adjusted at 14% moisture.

Results and Discussion

The number of panicles progressively increased with the increase of plant density. BR22, BR23 and Nizersail produced 36-45, 27-43 and 34-38 percent higher number of panicles in closer spacing (15×10cm) respectively compared to wider spacing (25 × 25 cm) in both the years (Table 1). It was found that planting of rice with 67 hills/m^2 (15 × 10 cm) increased number of panicles significantly over 33 hills

Table 1. Effect of plant population density of photoperiod-sensitive varieties on panicle (no./m^2) production planted late on T. Aman season (BRRI, Gazipur).

	1989			1990		
Spacing (cm)	BR22	BR23	N. Sail	BR22	BR23	N. Sail
25 × 25	248 cAB	212 bB	272 cA	237 dAB	187 cB	296 dA
25 × 20	267 bcB	215 bB	324 bA	234 dB	229 cB	334 cdA
25 × 15	282 bcB	238 abB	373 abA	284 cdB	302 bB	374 bcA
20 × 15	297 bcB	256 abB	415 aA	325 bcB	314 bB	412 bA
15 × 15	310 bB	284 aB	419 aA	377 abAB	331 bB	418 abA
15 × 10	386 aA	289 aB	413 aA	433 aAB	398 aB	475 aA

In a column, means having a common small letter (s) are not significantly different by DMRT at 5% level.
In a row, means having a common capital letter (S) are not significantly different by DMRT at 5% level.

(20×15 cm)/m^2 irrespective of varieties in 1990. However, BR22 and Nizersail planted with 44 hills/m^2 and 67 hills/m^2 gave similar number of panicles. Shah *et. al.* (1990) reported that planting of rice in closer spacing increased the number of effective tillers/m^2 compared to wider spacing. Among the varieties Nizersail exhibited the highest number of panicles followed by BR22 and BR23 irrespective of planting density in both the experiments. Similar finding was reported by Mannan and Siddique (1990). Apparently, this is inherent character of the variety to produce higher or lower number of productive tillers.

The spikelet sterility of BR22 was almost similar in different planting densities in both the years. Whereas, in BR23 the sterility percentage decreased with the increase of plant density. In Nizersail it varied significantly due to different plant densities particularly in 1989 and in 1990 it varied from 14 to 21% (Table 2). Among the varieties the highest percentage of sterility was observed in BR23. Probably, due

Table 2. Effect of plant population density of photoperiod-sensitive varieties on spikelet sterility (%) planted late in T. Aman season (BRRI, Gazipur).

Spacing (cm)	1989			1990		
	BR22	BR23	N. Sail	BR22	BR23	N. Sail
25 × 25	23 aB	42 aA	25 abcB	19 aB	35 aA	21 aB
25 × 20	21 aB	37 abA	18 cB	18 aB	35 aA	17 aB
25 × 15	18 aB	28 cA	20 bcAB	17 aB	30 abA	19 aB
20 × 15	20 aA	30 bcA	28 aA	15 aB	27 bA	20 aB
15 × 15	22 aA	29 cA	27 abA	13 aB	24 bA	14 aB
15 × 10	20 aA	26 cA	24 abcA	15 aB	25 bA	17 aB

In a column, means having a common small letter (s) are not significantly different by DMRT at 5% level.
In a row, means having a common capital letter(S) are not significantly different by DMRT at 5% level.

to its sensitivity to low temperature at the reproductive stage increased sterility.

Grain weight of the tested varieties did not vary significantly in different planting densities in both the years. Seed weight of BR23 was however, significantly heavier over BR22 and Nizersail. Eunus and Sadeque (1974) reported that due to planting densities grain weight did not very significantly.

The grain yield of BR22 and BR23 did not differ significantly between planting densities of 16 and 33 hills/m^2; but with 67 hills/m^2 the grain yield increased significantly (Table 3). Reduction of grain yield in wider spacing probably due to lack of adequate number of effective tillers in late planted aman crop. Yield differences in different plant density was identical in Nizersail. The variety BR22 and BR23 produced signifiantly higher grain yield over Nizersail irrespective of plant density in 1989 and 1990. The increased grain yield of BR23 was due to reduced grain sterility as affected by higher plant densities. Gomosta *et al.* (1989) reported that 29% higher number of spikeletes/m^2 was found in BR22 compared to Nizersail.

Based on the findings of these studies it can be concluded that the late planted T. Aman yield of modern photoperiod sensitive varieties

Table 3. Effect of plant population density of photoperiod-sensitive rice on grain yield (t/ha) in late Aman season (BRRI, Gazipur).

Spacing (cm)	1989			1990		
	BR22	BR23	N. Sail	BR22	BR23	N. Sail
25 × 25	3.74 cA	3.66 dA	3.35 aA	2.93 cAB	3.29 bA	2.62 aB
25 × 20	4.18 bcA	4.08 cdAB	3.64 aB	3.19 bcA	3.39 bA	2.69 aB
25 × 15	4.22 bA	4.35 bcA	3.72 aB	3.27 bcAB	3.61 bA	2.80 aB
20 × 15	4.19 bcAB	4.48 bcA	3.74 aB	3.51 abA	3.51 bA	2.98 aB
15 × 15	4.64 abA	4.56 abA	3.79 aB	3.86 aA	3.81 abA	3.03 aB
15 × 10	4.91 aA	4.96 aA	3.68 aB	4.00 aA	4.17 aA	3.10 aB

In a column, means having a common small letter (s) are not significantly different by DMRT at 5% level.
In a row means having a common capital letter(s) are not significantly different by DMRT at 5% level.

can be compensated substantially by increasing plant density (15 × 15 cm).

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