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PRODUCTIVITY OF BORO RATOON RICE UNDER DIFFERENT LEVELS OF NITROGEN

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Abstract

An experiment was carried out at the Agronomy Field, Sher-e-Bangla Agricultural University, Dhaka during November 2009 to July 2010 to study the effect of variety and varying levels of nitrogen application to ratoon crop of boro rice. Four varieties (BRRI hybrid dhan2, BRRI dhan29, BRRI dhan35 and BRRI dhan47) and four doses of nitrogen (0%, 25%, 50% and 75% N of recommended dose) were tested. These doses of N fertilizer were applied to the ratoon crop just after harvesting of the main crop leaving 15 cm stuble height above the ground level. Among the main crop BRRI hybrid dhan2 produced significantly highest grain yield (7.037 t ha^{-1}). In the ratoon crop grain yield of BRRI hybrid dhan2 and BRRI dhan29 with all levels of N application produced significantly higher grain yield (710-917 kg ha^{-1}). So, BRRI hybrid dhan2 and BRRI dhan29 with 25% extra N application could be considered for ratoon cropping.

Keywords: Boro Ratoon Rice, Nitrogen Fertilizer

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Introduction

Rice (*Oryza sativa* L.) is one of the most important primary cereal crops in the world (Nassiri and Pirdashti, 2003). The world population by the year 2050 has been projected to be approximately 11 billion people, of which 90% will reside in the developing countries of the South (Krattiger, 1996). To feed the increasing global population, the world's annual rice production must increase from the present 528 million ton to 760 million ton by 2020 (Kundu and Ladha, 1999). The development of ratooning rice is one of the methods to increase the yield all over the world because additional rice yields can be achieved with minimal agricultural inputs (Harrell *et al.*, 2009). Therefore, the benefit in ratooning lies in the facts of avoiding of elaborate land preparation, saving of seed and planting costs (Zandstra and Samson, 1979), economic use of machineries, high water use efficiency (Prashar, 1970) and considerable saving in cropping time as it has the advantage of reduced growth duration (Haque and Coffman, 1980). Rice ratooning has several stated advantages: lowproduction costs, high water use efficiency, and reduced growth duration (Jones, 1993).

On an average, ratoon rice can give a yield roughly equivalent upto 40% of that of the main crop with 40% reduction in crop duration (Samson, 1980). Faria (1984) mentioned that production of irrigated ratoon rice in Brazil covered 30% of that of the first crop and in other countries the corresponding figure was 50%. Ratoon yield is generally less than the main crop but higher yields have also been reported by Santhi *et al.* (1993). Reddy *et al.* (1979) reported that the ratoon crop of Intan rice variety yielded 140% of its main crop yield in Karnataka. Under Bangladesh context, there are potentials for rice ratooning from the stubble of boro rice with residual soil moisture and monsoon rain. In this country, crop intensification through rice ratooning constitutes one of the important options for the farmers in achieving food security. Ratooning is a natural phenomenon in grass family (*Gramineae*) which is basically a varietal character and differs among cultivars (Chatterjee *et al.*, 1982). Zhang (1991) indicated that ratoon yield is affected by variety Prakash and Prakash (1988) stated that, there has been considerable effort to select rice cultivars for superior

ratoonability. The photosynthetic products and nutrient left in the rice stubbles had a great effect on the growth and development of the ratoon crop (Liu *et al.*, 1993).

Although ratoon ability is a varietal characteristic, manipulation of cultural practices can enhance a good ratoon crop of rice (Quddus, 1981). Kasturi and Purushothaman (1992) also observed that grain yield varied with different fertilizer dose. Comparatively larger amounts of nitrogen is required by plants than other elements. Nitrogen (N) fertility is one of the most important factors influencing ratoon crop grain yield and, in general, N application increases ratoon rice yield (Turner and McIlrath, 1988). Application to the ratoon crop of about 75% of the main crop nitrogen fertilization rate is sufficient to obtain high ratoon yield (Evatt and Beachell, 1960). N applied immediately after main crop harvest significantly affected ratoon yield (Nassiri and Pirdashti,2003).

The present study was, therefore, undertaken to find out the effect of variety and different levels of nitrogen (N) application on ratoonability of boro rice. The research work was conducted to achieve the following objectives:

- To observe the performance of different boro rice varieties under ratoon cropping.
- To measure the productivity of ratoon boro rice under different levels of N application.
- To assess the optimum level of N to produce optimum yield of rice under ratoon cropping.
- To study the interaction effect of different varieties and different levels of N application.

Materials and Methods

The experiment was conducted at the Agronomy Field, Sher-e- Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka during the period from November 2009 to July 2010. The experimental field was located at 90° 22'E longitude and 23°41'N latitude at an altitude of 8.6 meters above the sea level. The land was located at "Madhupur Tract" (AEZ 28) (SRDI, 2009).

The field of the experimental site belonged to the Tejgaon series, which was characterized by shallow red brown terrace soils. The soil was well drained and medium high. The soil was loam in texture and having soil pH ranges from 5.46 to 5.61. Organic matter content was very low (0.82%). Four boro rice varieties released by BRRI was selected as planting materials. Selected varieties were BRRI hybrid dhan2, BRRI dhan29, BRRI dhan35 and BRRI dhan47.

Treatments of the experiment

The experiment was consisted of the following treatments:

Factor A: Variety (V)

i. V_1 = BRRI hybrid dhan2.
ii. V_2 = BRRI dhan29.
iii. V_3 = BRRI dhan35 and
iv. V_4 = BRRI dhan47.

Factor B: Nitrogen dose (N) applied after the harvest of main crop

i. N_0 = No nitrogen.
ii. N_1 = 25 % nitrogen of recommended dose for main crop.
iii. N_2 = 50 % nitrogen of recommended dose for main crop.
iv. N_3 = 75% nitrogen of recommended dose for main crop.

Design and layout of the experiment

The experiment was laid out in Split Plot Design allotting nitrogen in the main plots and variety in the sub-plots with three replications. Therefore, the total number of plots was 48 (16 × 3). The area of unit plot was 3 square meter (2.0 m x 1.5 m). One meter (1 m) of distance was maintained between plots and between replications.

Cultural operation for main crop

Seed of 3 high yielding rice variety viz. BRRI dhan29, BRRI dhan35 and BRRI dhan47; and one hybrid rice variety viz. BRRI hybrid dhan2 were collected from Bangladesh Rice Research Institute (BRRI), Joydebpur, Gazipur. The seeds were dipped in water in a bucket for 24 hours. The seeds were then taken out of water and kept thickly in gunny bags. The seeds started sprouting after 24 hours and completed sprouting within 48 hours and became suitable for sowing in the seed bed by 72 hours. A piece of high land was selected in the Agronomy Field of Sher-e-Bangla Agricultural University, Dhaka for raising seedlings. The land was puddle with country plough, cleaned and leveled thoroughly with ladder to get a well puddle and leveled seed bed. The sprouted seeds were sown in the prepared seed beds on 29 November 2009. The land was opened in a water saturated condition with power tiller during last week of the December, 2009. The land was then repeatedly ploughed and cross ploughed with power tiller for preparation. The clods were broken and the land was leveled with tiller ladder. The weeds and stubble were removed.

Fertilizers were applied to the plots following the recommendation by BRRI for the specific variety.

Table 1. Fertilizer dose ((kg ha^{-1}) recommended by BRRI for the selected rice varieties.

Variety	N	P_2O_5	K_2O	S	Zn
BRRI hybrid dhan2	216.77	114.44	143.62	24.24	5.39
BRRI dhan29	120.43	35.34	53.86	10.09	2.29
BRRI dhan35	120.43	35.34	53.86	8.07	2.83
BRRI dhan47	86.02	43.76	40.39	10.77	4.04

Source: *BRRI factsheet*

The whole amount of fertilizers except N was applied before final land preparation. Urea was top dressed in three equal splits at 15, 30 and 45 days after transplanting.

Irrigation was provided during the whole growth period of the crop in order to maintain a constant water level in the field. Before top dressing of urea, water was drained off the plots. The plots were again irrigated after the application of urea. Excess water was drained out during the heavy rainfall. Before 15 days of harvest the field was finally drained out to enhance maturity.

Crops were infested with different weeds. Weeding was done two times by hand pulling on 2 February 2010 and 1 March 2010.

Cultural operation for ratoon crop

The next day after harvesting of the main crop, the field was hand weeded and urea was top dressed at the rate mentioned as the treatments. It was then mixed thoroughly with soil by a weeder. Some irrigation was necessary as there was little or no rainfall during the growing period of the ratoon crop. Drainage was made as and when required. Disease infection and insect attack was not significant to take plant protection measure. To protect the crop from birds attack the field was observed frequently. However, some grains were lost by birds and rats attack.

Ten hills from each plot of main and ratoon crop were randomly selected, uprooted and properly tagged before harvesting for recording the necessary data on crop characters. The crop of each plot was harvested at full maturity when 80% of the grains turned in golden yellow color.

Data on the following yield and yield contributing characters of main crop and ratoon crop were collected: plant height, total number of tillers hill^{-1}, days to maturity,number of total grains panicle^{-1}, grain yield.

Statistical analysis

The recorded data for different parameters were compiled and tabulated in proper form for statistical analysis. Analysis of variance was done with the help of computer software package MSTAT-C program. The mean differences among the treatments were adjudged by Least Significant Difference (LSD) (Gomez and Gomez, 1984).

Results and Discussion

Plant height

Effect of variety on the plant height of main crop and ratoon crop

BRRI dhan35 had significant higher plant height in the main crops (Table 2). Numerically, in the main crops the tallest (97.45 cm) and shortest (92.45 cm) plant height were recorded in BRRI dhan35 and BRRI hybrid dhan2, respectively. Different varieties exerted significant effect on plant height of ratoon crop (Table 2). Numerically the highest plant height of ratoon crop (68.53 cm) was recorded in BRRI dhan29, whereas the lowest (61.23 cm) in BRRI dhan47.

Effect of N on the plant height of ratoon crop

Islam *et al.* (2008) and Zandstra and Samson (1979) stated that pant height increased significantly due to nitrogen application. In every case, the plant height of the ratoon crop was lower than the main crop and it ranged from 70-73% of the main crop. It was due to less ability to use the resources in plant body and it was confirmed by Jones (1993).

However, in N-applied plots, plant height of ratoon crop was significantly higher than control plots (Table 2). They were statistically identical but numerically different. Numerically, the tallest (69.04 cm) plants were obtained from the treatment N_3 (75% N of the recommended dose). On the contrary, the shortest (58.97 cm) plants were produced by control plots.

Interaction effect of variety and N on the plant height of ratoon crop

Numerically, the tallest plants (73.73 cm) were produced by the interaction of BRRI dhan29 and N_3. At the same time, shortest (55.73 cm) plants were obtained from the variety BBRI dhan47 without N application.

Table 2. Effect of variety and N on the plant height of boro rice under ratoon cropping.

Variety	N dose	V×N Interaction	Plant height at maturity (cm)	
			Main crop	Ratoon crop
BRRI hybrid dhan2 (V_1)	-	-	92.45	62.84
BRRI dhan29 (V_2)	-	-	95.72	68.53
BRRI dhan35 (V_3)	-	-	97.45	64.07
BRRI dhan47 (V_4)	-	-	95.27	61.23
LSD $_{(0.05)}$	-	-	1.06	6.86
CV (%)	-	-	8.42	
-	N_0	-	-	58.97
-	N_1	-	-	62.86
-	N_2	-	-	65.80
-	N_3	-	-	69.04
-	LSD $_{(0.05)}$	-	-	6.856
-	-	$V_1 \times N_0$	-	60.73
-	-	$V_1 \times N_1$	-	60.40
-	-	$V_1 \times N_2$	-	64.00
-	-	$V_1 \times N_3$	-	66.23
-	-	$V_2 \times N_0$	-	62.23
-	-	$V_2 \times N_1$	-	69.30
-	-	$V_2 \times N_2$	-	68.87
-	-	$V_2 \times N_3$	-	73.73
-	-	$V_3 \times N_0$	-	57.20
-	-	$V_3 \times N_1$	-	60.53
-	-	$V_3 \times N_2$	-	69.73
-	-	$V_3 \times N_3$	-	68.80
-	-	$V_4 \times N_0$	-	55.73
-	-	$V_4 \times N_1$	-	61.20
-	-	$V_4 \times N_2$	-	60.60
-	-	$V_4 \times N_3$	-	67.40
-	-	LSD $_{(0.05)}$	-	13.70
-		CV (%)		10.75

N_0 = No nitrogen application, N_1 = 25% of recommended nitrogen fertilizer, N_2 = 50% of recommended nitrogen fertilizer and N_3 = 75% of recommended nitrogen fertilizer.

Total number of tillers hill^{-1}

Effect of variety on the total number of tillers hill^{-1} of main crop

The total number of tillers hill^{-1} of main crop was highly influenced by the variety (Table 3). Significantly the highest (13.32) total number of tillers hill^{-1} was produced by BRRI dhan29. Total number tillers hill^{-1} of other three varieties was statistically at par. Numerically BRRI dhan35 produced the lowest (10.47) total number of tiller hill^{-1}.

Effect of variety on the total number of tillers hill^{-1} of ratoon crop

Total number of tiller hill^{-1} of ratoon crop was significantly influenced by variety (Table 3). Like main crop BRRI dhan29 produced the highest (10.98) total number of tiller hill^{-1} during ratoon crop production whereas the lowest (7.83) total number of tillers hill^{-1} was produced by BRRI dhan47. BRRI hybrid dhan2 and BRRI dhan35 produced statistically identical number of tillers hill^{-1}.

Effect of N on the number of tillers hill^{-1} of ratoon crop

Lafarge (2000) stated that the effect of N fertilizer rates on and number of tillers hill^{-1} was significant. N-doses did not have significant effect on the total number of tillers hill^{-1} (Table 3). Treatment N_2 (50% N of recommended dose) and N_3 (75% of recommended N) produced significantly higher total number of tillers hill^{-1} compared to N_0 and N_1. But numerically highest (10.39) number of tillers hill^{-1} was produced by treatment N_3

Interaction effect of variety and N on the total number of tillers hill^{-1} of ratoon crop

BRRI dhan29 with N_2 and N_3 produced significantly higher total number of tillers hill^{-1}

(Table 3). Numerically the highest (12.47) total number of tillers hill^{-1} was recorded from the interaction of BRRI dhan29 and N_2, whereas the minimum (6.93) one was recorded in control plots of BRRI dhan47.

Table 3. Effect of variety and N on the total number of tillers hill^{-1} of boro rice under ratoon cropping.

Variety	N dose	V×N Interaction	Total number of tillers hill^{-1}	
			Main crop	Ratoon crop
BRRI hybrid dhan2 (V_1)	-	-	10.92	9.64
BRRI dhan29 (V_2)	-	-	13.32	10.98
BRRI dhan35 (V_3)	-	-	10.47	9.63
BRRI dhan47 (V_4)	-	-	11.67	7.83
LSD $_{(0.05)}$	-	-	1.30	0.73
CV (%)	-	-	13.46	-
-	N_0	-	-	8.42
-	N_1	-	-	9.18
-	N_2	-	-	10.09
-	N_3	-	-	10.39
-	LSD $_{(0.05)}$	-	-	0.73
-	-	$V_1 \times N_0$	-	8.97
-	-	$V_1 \times N_1$	-	9.33
-	-	$V_1 \times N_2$	-	10.0
-	-	$V_1 \times N_3$	-	10.27
-	-	$V_2 \times N_0$	-	9.10
-	-	$V_2 \times N_1$	-	10.20
-	-	$V_2 \times N_2$	-	12.47
-	-	$V_2 \times N_3$	-	12.13
-	-	$V_3 \times N_0$	-	8.67
-	-	$V_3 \times N_1$	-	9.43
-	-	$V_3 \times N_2$	-	9.73
-	-	$V_3 \times N_3$	-	10.67
-	-	$V_4 \times N_0$	-	6.93
-	-	$V_4 \times N_1$	-	7.73
-	-	$V_4 \times N_2$	-	8.17
-	-	$V_4 \times N_3$	-	8.50
-	-	LSD $_{(0.05)}$	-	1.47
-	CV (%)			9.25

N_0 = No nitrogen application, N_1 = 25% of recommended nitrogen fertilizer, N_2 = 50% of recommended nitrogen fertilizer and N_3 = 75% of recommended nitrogen fertilizer.

Days to Maturity

Effect of variety on thedays to maturity of main crop

Variety had significant effect on the days to maturity of main crop (Fig. 1). BRRI hybrid dhan2 required the minimum (145.90) days to become matured whereas BRRI dhan47 required the maximum (158.50) days to maturity. Jones and Snyder (1987) reported that ratoon rice needs very short growth duration usually taking only 35% to 60% of the time required for the main crop.

Effect of variety on days to maturity of ratoon crop

Effect of variety on days to maturity of ratoon crop was significant (Fig. 1). BRRI hybrid dhan2 and BRRI dhan29 required significantly higher number of days to maturity than other two varieties. BRRI dhan47 required the minimum (45.33) days whereas BRRI hybrid dhan2 required the maximum (61.17) days to become mature followed by BRRI dhan29.

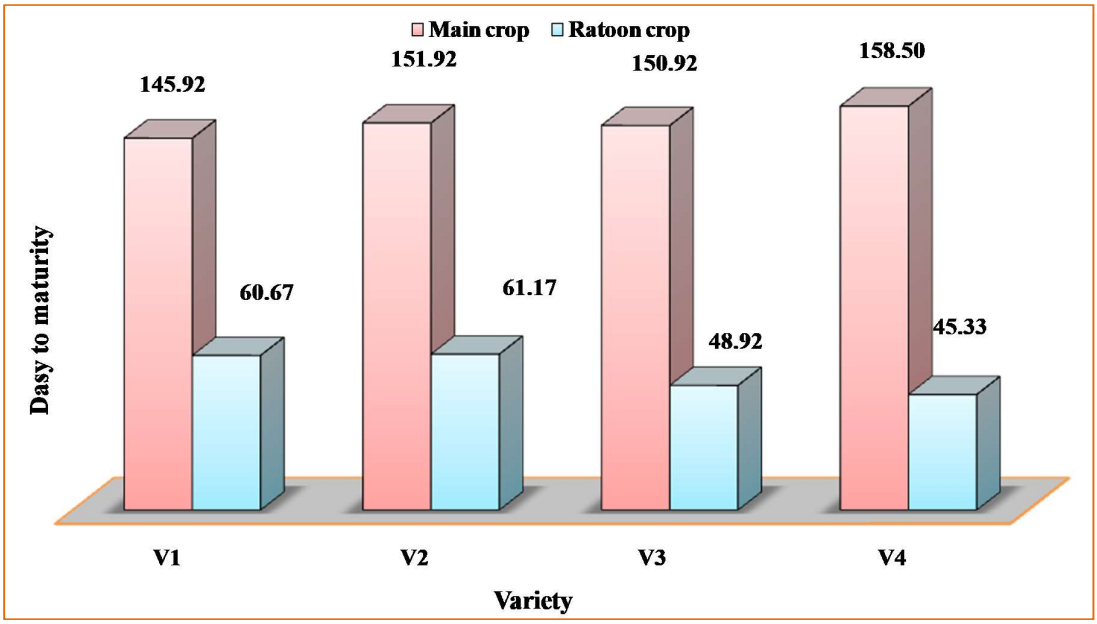

Fig. 1. Effect of variety on the days to maturity of main and ratoon crop {LSD $_{(0.05)}$ = 1.97 (main crop) 1.69 (ratoon crop)}.

Effect of N on the days to maturity of ratoon crop

All the N-applied plots required statistically higher number of days to maturity. Thus N affect negatively on the days to maturity of ratoon crop. However the highest (56.33) number of days to maturity was found in control plots, whereas the highest N applied plots took the lowest (52.42) number of days to become mature (Fig. 2).

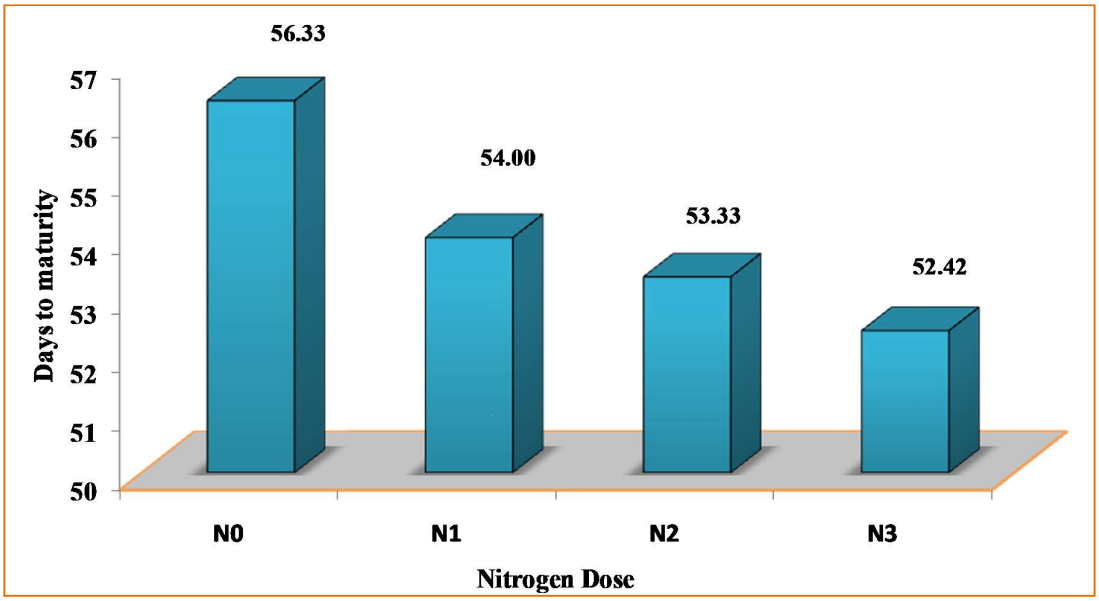

Fig. 2. Effect of N on the days to maturity of ratoon crop (LSD $_{(0.05)}$ = 1.69).

Interaction effect of variety and N on the days to maturity of the ratoon crop

The interaction effect of variety and N dose on days to maturity of ratoon crop was significant (Fig. 3). BRRI hybrid dhan2 with N_0 and BRRI dhan29 with all N applied plots required statistically higher number of days to mature.

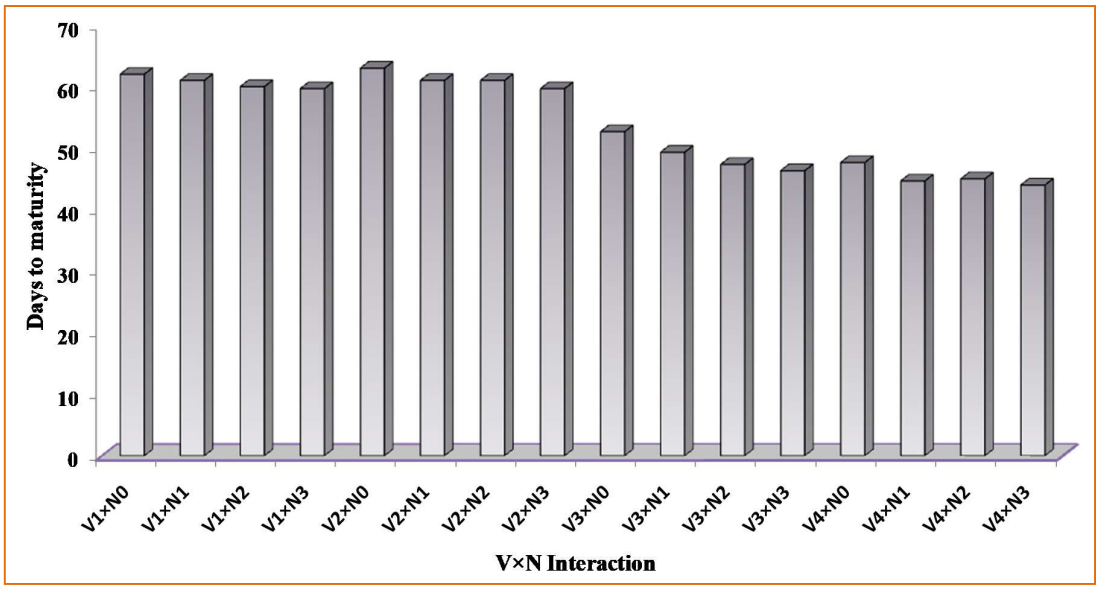

Fig. 3. Interaction effect of variety and N on the days to maturity of ratoon crop (LSD $_{(0.05)}$ = 3.37).

Total number of grains panicle^{-1}

Effect of variety on the total number of grains panicle^{-1} of main crop

The total number of grains panicle^{-1} of the main crop was significantly affected by the variety (Fig. 4). The highest (285.34) total number of grains panicle^{-1} was recorded in BRRI dhan47. It was statistically similar to BRRI dhan29.

Effect of variety on the total number of grains panicle^{-1} of ratoon crop

Different varieties had significant effect on the total number of grains panicle^{-1} of ratoon crop. (Fig. 4). Total number of grains panicle^{-1} produced by different varieties was statistically similar. Total number of grains panicle^{-1} of BRRI dhan29 and BRRI dhan35 was significantly higher than that of other two varieties. Numerically BRRI dhan35 produced the highest (137.40) total number of grains panicle^{-1} followed by BRRI dhan29 (123.20). The lowest (95.48) total number of grains panicle^{-1} was produced by BRRI dhan47.

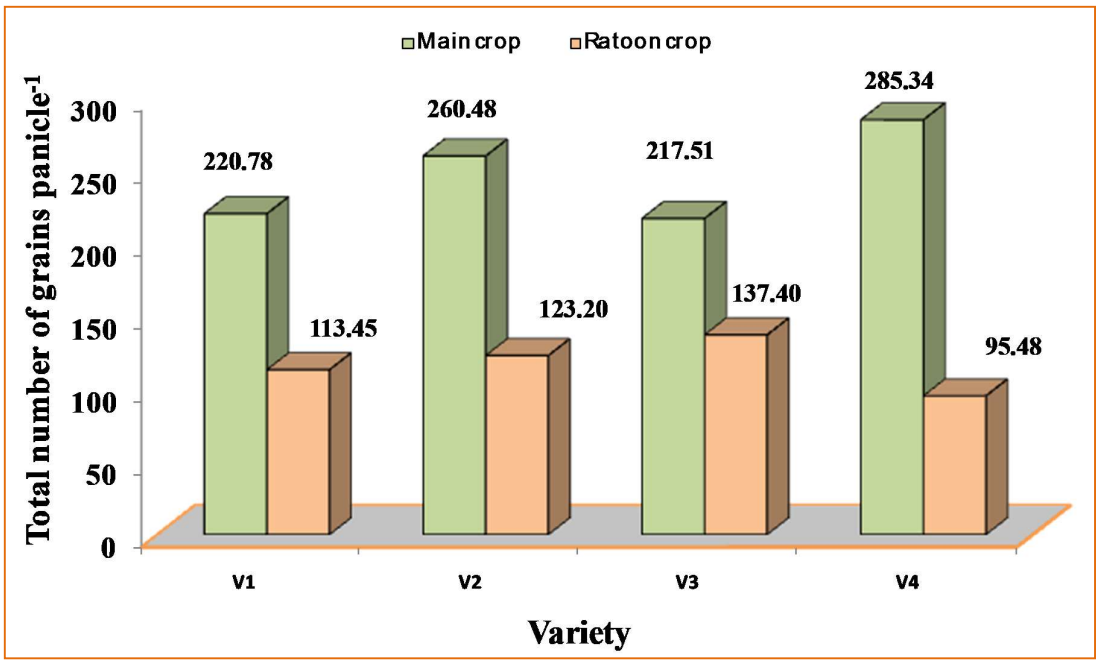

Fig. 4. Effect of variety on the total number of grains panicle^{-1} of main crop and ratoon crop {LSD $_{(0.05)}$ = 25.15 (main crop) 8.56 (ratoon crop)}.

Effect of N dose on the total number of grains panicle⁻¹ of ratoon crop

The total number of grains per panicle of the ratoon crop was significantly affected by N doses (Fig. 5). The highest (148.317) total number of grains panicle⁻¹ was recorded in the 75% recommended N-applied plots.

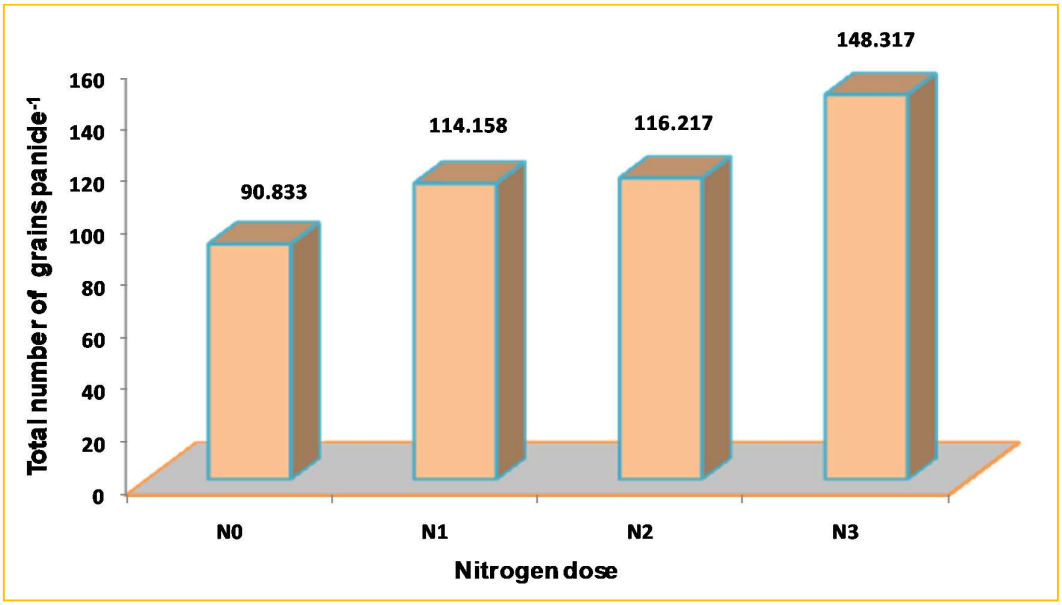

Fig. 5. Effect of N on the total number of grains panicle⁻¹ of ratoon crop (LSD $_{(0.05)}$ = 18.56).

Interaction effect of variety and N on the total number of grains panicle⁻¹ of ratoon crop

Numerically, the highest (180.50) total number of grains panicle⁻¹ was produced by BRRI dhan29 with application of N_3. Control plots of BRRI hybrid dhan2 and BRRI dhan29, BRRI dhan47 and interaction of N_1 and N_2 with BRRI dhan47 produced significantly lower total number of grains panicle⁻¹. The lowest (69.00) one was produced by BRRI dhan47 without N application (Fig. 6)

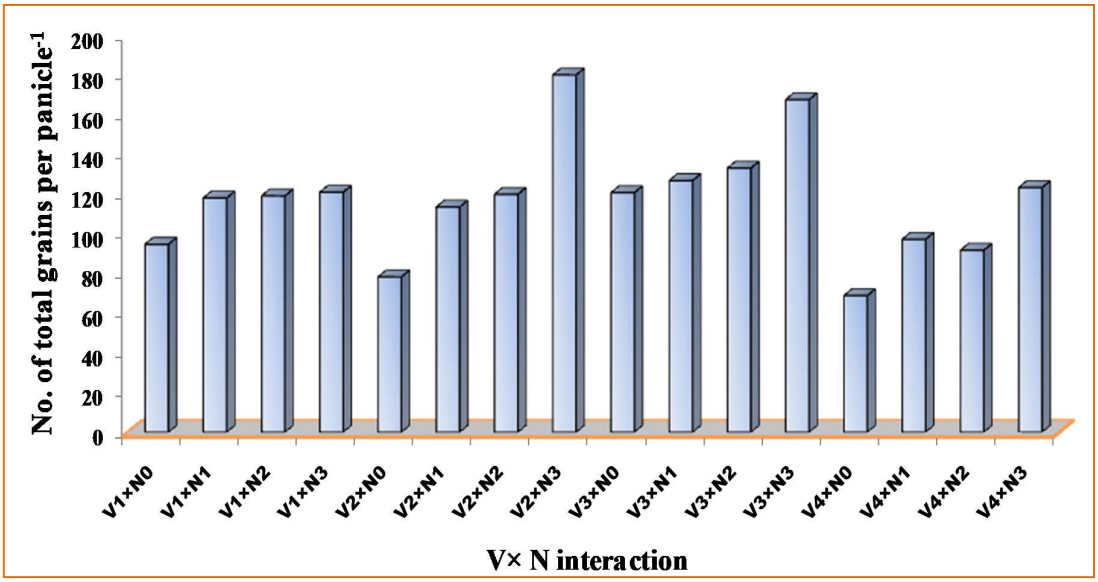

Fig. 6. Interaction effect of variety and N on the number of total grains panicle⁻¹ of ratoon crop (LSD$_{(0.05)}$ = 37.13).

Grain yield

Effect of variety on the grain yield of main crop

Grain yield is the main objective of rice cultivation. Generally the yield contributing characters like, number of effective tillers hill^{-1}, number of grains panicle^{-1}, weight of individual grains or thousand grain weights combine contribute to the yield of rice. In this study, the grain yield was significantly affected by the variety of rice (Table 4). The highest (7.04 t ha^{-1}) grain yield was produced by BRRI hybrid dhan2 followed by BRRI dhan29 (5.96 t ha^{-1}). The yield of BRRI dhan29 was statistically similar to, but numerically higher than BRRI dhan35. It may be due to varietal characteristics and initial soil fertility. The lowest (5.00 t ha^{-1}) yield was obtained by BRRI dhan35.

Effect of variety on the grain yield of ratoon crop

Variety of rice had significant effect on the grain yield of ratoon crop (Table 4). BRRI hybrid dhan2 and BRRI dhan29 gave statistically higher grain yield than BRRI dhan35 and BRRI dhan47. The highest grain yield (0.83 t ha^{-1}) was produced by BRRI dhan29, followed by BRRI hybrid dhan2. The lowest (0.21 t ha^{-1}) grain yield was recorded in BRRI dhan47. BRRI dhan29 produced the highest (13.95) percentage of grain yield of main crop followed by BRRI hybrid dhan2 (11.50). BRRI dhan47 produced the lowest (3.70) percentage grain yield of that of main crop.

Effect of N on the grain yield of ratoon crop

All the N-applied plots gave significantly higher grain yield than control plots. Numerically, the highest grain yield (0.66 t ha^{-1}) was obtained from 75% N application during ratoon crop production. The lowest yield (0.52 t ha^{-1}) was produced in control plots. The grain yield percentage of main crop produced by ratoon crop increased by the increasing level of N. Numerically N_3 gave the highest (10.95) percentage of grain yield of main crop followed (9.93) by N_2.

Interaction effect of variety and N on the grain yield of ratoon crop

The interaction of variety and N dose had significant effect on grain yield of ratoon crop (Table 4). N application to the BRRI hybrid dhan2 and BRRI dhan29 gave significantly higher yield than others. Apparently, the highest (0.92 t ha^{-1}) grain yield was obtained from the interaction of BRRI dhan29 and 75% recommended N application, followed by the interaction of BRRI hybrid dhan2 with the same N dose. BRRI dhan47 gave significantly lower grain yield with application of N.

Table 4. Effect of variety and N on the grain yield of boro rice under ratoon cropping.

Variety	N dose	V×N Interaction	Grain yield (t ha^{-1})		% of main crop*
			Main crop	Ratoon crop	
BRRI hybrid dhan2 (V_1)	-	-	7.04	0.74	11.50
BRRI dhan29 (V_2)	-	-	5.96	0.83	13.95
BRRI dhan35 (V_3)	-	-	5.00	0.45	8.97
BRRI dhan47 (V_4)	-	-	5.71	0.21	3.70
LSD $_{(0.05)}$	-	-	0.36	0.10	-
CV (%)	-	-	22.51	-	-
-	N_0	-	-	0.52	8.70
-	N_1	-	-	0.55	9.27
-	N_2	-	-	0.58	9.93
-	N_3	-	-	0.66	10.95
-	LSD $_{(0.05)}$	-	-	0.10	-
-	-	$V_1 \times N_0$	-	0.69	9.65
-	-	$V_1 \times N_1$	-	0.80	10.99
-	-	$V_1 \times N_2$	-	0.83	12.18
-	-	$V_1 \times N_3$	-	0.89	13.28
-	-	$V_2 \times N_0$	-	0.71	12.12
-	-	$V_2 \times N_1$	-	0.86	14.73
-	-	$V_2 \times N_2$	-	0.86	13.83
-	-	$V_2 \times N_3$	-	0.92	15.11
-	-	$V_3 \times N_0$	-	0.34	6.54
-	-	$V_3 \times N_1$	-	0.43	8.72
-	-	$V_3 \times N_2$	-	0.48	9.79
-	-	$V_3 \times N_3$	-	0.54	11.01
-	-	$V_4 \times N_0$	-	0.34	5.96
-	-	$V_4 \times N_1$	-	0.12	2.03
-	-	$V_4 \times N_2$	-	0.15	2.78
-	-	$V_4 \times N_3$	-	0.23	3.98
-	-	LSD $_{(0.05)}$	-	0.20	-
-	-	CV (%)	-	21.30	-

N_0 =No nitrogen application, N_1 = 25% of recommended nitrogen fertilizer, N_2 =50% of recommended nitrogen fertilizer and N_3 =75% of recommended nitrogen fertilizer.

Conclusion

The ultimate objective of this experiment was to test the varieties in terms of their grain yield under different levels of N fertilizer. Based on the present study it can be said that for ratooning of boro rice under the agro-ecological conditions of experimental field, BRRI hybrid dhan2 and BRRI dhan29 gave significantly higher yield with N application. Using 25% extra N to ratoon crop after the harvest of main crops may give economic yield of ratoon crop of BRRI hybrid dhan2 or BRRI dhan29. But, the yield was not economically so much higher as found in the previous literature. Therefore, some other variety may be tested for the commercial ratoon crop cultivation. Some recommendation can be statedto select a high performance ratoon rice variety under Bangladesh context more comprehensive study should be conducted and decisions about the appropriate application rate of N fertilizer demands further field specific research based on findings on the benefit over cost of N application.

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