

Research Article

Farmers' Participatory Demonstration of Nitrogen Application Methods during T. Aman Season in Barisal Region of Bangladesh

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Abstract: The demonstration was carried out at the farmers' fields of Barisal region of Bangladesh to evaluate the effectiveness of fertilizer application methods in T. Aman rice in non-saline tidal flooded soil during July to December, 2015. Twenty-five-day old seedlings of BRR dhan52 was transplanted in randomized complete block design with three replications. The trial was conducted in five locations (Babuganj, Barisal; Nolchiti, Jhalokathi; Barisal Sadar, Barisal; Amtoli, Barguna and Kolapara, Patuakha). Deep placement of urea super granule (USG) (1.8 g size) + PKSZn from BRR recommended dose was compared with BRR recommended fertilizer dose and farmers' fertilizer management. The result showed that USG treated plots produced statistically the highest grain yield and less spikelet sterility compared with BRR recommended fertilizer dose and farmers' practices at all locations. Also, panicles per unit area and grains per panicle were highest in USG treated plot than broadcasted urea. Thus, the results revealed that USG application is the best N source in non-saline tidal ecosystem of Barisal region in T. Aman rice.

Keywords: Urea super granule, prilled urea, grain yield, T. Aman rice.

INTRODUCTION

Rice is extensively grown in Bangladesh in three seasons namely, Aus, Aman and Boro, which covers 80% of the total cultivable area of the country [1]. It is great source to nutritional calories, providing 35-80% of total calorie uptake [2]. Rice provides about 66% of the protein intake of the people's diet [3]. Rice production needs to be increased by 50% or more above the current production level to meet the rising food demand [4]. Because the present nutritional situation of developing countries like Bangladesh is a matter of great concern since the most of the people are suffering from malnutrition [5, 6]. The application of fertilizer in proper amounts must be done to boost up agricultural production to an economically desirable level [7]. Judicious use of fertilizers can markedly increase the yield and improve the quality of rice [8]. Nitrogen (N) is one of the most yield limiting nutrients in rice production around the world, especially in tropical Asian soils and almost every farmer has to apply N fertilizer to get a desirable yield of rice [9]. Tidal wetland is one of the important areas of less favorable environments in Bangladesh covering a large area (about 2 mha) of tidal floodplain in the southern part of the country. The major environmental problem for crop production in non-saline tidal wetland situation is daily tidal inundation of land and about 80% of the cultivable land of greater Barisal and Patuakhali districts is

inundated up to the range of 6-90 cm for about 4-5 months from June to October. In the tidal wetland situation, where it is not possible to follow the recommendation schedule of split application of urea (source of N) and other nutrients and where the risk of losses of surface applied N or other nutrients exists, an effective alternative may be the use of USG for higher yield of rice. When it is applied in super granule form, its application efficiency is increased to 60 per cent [10]. Because deep placement of nitrogen fertilizer into the anaerobic soil zone is a recognized effective method to reduce its volatilization loss from rice field [11]. In tidal ecosystem, nutrient management strategies would be different from other ecosystem. Because, applied NPK fertilizers are washed-out from rice field during tidal flood. So, deep placement of all fertilizers would be effective rather than broadcasting [12]. Therefore, the present study was undertaken to evaluate the performance of different methods of urea application in southern region (especially in Barisal and Patuakhali district) in farmers' fields.

MATERIALS AND METHODS

The experiment was conducted in farmers' fields at Babuganj, Barisal; Nolchiti, Jhalokathi; Barisal Sadar, Barisal; Amtoli, Barguna and Kolapara, Patuakhali during T. Aman season, 2015. The treatments were; i) BRR Recommended fertilizer dose,

ii) USG (1.8g; N= 50 kg ha⁻¹) + PKSZn from BRRl Recommended fertilizer dose, and iii) Farmer's practice. The experimental field was laid out in RCB design with three replications. Twenty-five-day-old seedlings of BRRl dhan52 were transplanted in all the locations with 20 cm × 20 cm spacing. The unit plot size was 5 m × 4 m. BRRl recommended fertilizer doses were; N:P:K:S:Zn= 93:15:30:9:2 kg ha⁻¹, whereas the farmer's practice was at Babuganj N:P:K= 78:2:5 kg ha⁻¹; at Nolchiti N:P:K= 83:7:15 kg ha⁻¹; at Barisal Sadar N:P:K= 83:6:15 kg ha⁻¹; at Amtoli N:P:K= 97:12:26 kg ha⁻¹ and at Kolapara N:P:K= 87:9:14 kg ha⁻¹. USG was applied at 7 days after transplanting (DAT) as per treatment. Full dose of TSP, MOP, Gypsum and ZnSO₄ were applied during final land preparation. The urea was applied as top dress at 15, 30 and 45 DAT. Irrigation, insect and weed control were done as and when necessary. Data on plant height, number panicle per unit area, grains panicle⁻¹, sterility (%) and grain yield were recorded at harvest. The data were subjected to statistical analyses using Statistix 9.0 statistical program.

RESULTS AND DISCUSSION

Plant height

Plant height of BRRl dhan52 did not differ significantly among the treatments (Table 1). But the highest plant height was found with USG treated plot. However, in different locations, variation in plant height was observed (Table 2). The highest plant height was found in Nolchiti (114.7 cm) which was statistically similar in Amtoli and Kolapara. The lowest of that was found in Babuganj (107.3 cm). [10] also found that application of urea super granule showed the highest plant height than prilled urea application.

USG treated plot showed the tallest plant height (115.3 cm) in Nolchiti (Table 3). Similar result was also found in USG treatment in Amtoli and Kolapara. On the other hand with BRRl recommended dose, in Nolchiti, Amtoli and Kolapara similar results were observed. The lowest plant height (107.3 cm) was found in farmers' practice in Babuganj and Barisal sadar.

Table 1: Effect of fertilizer application methods on grain yield at Barisal region of Bangladesh in T. Aman, 2015 (on an average of five locations)

	Plant height (cm)	Panicle per m ²	Grains per panicle	Sterility (%)	Grain yield (t/ha)
BRRl recom. dose	112.7	274	86	16.39	4.82
USG + PKSZn	113.0	294	89	14.45	5.13
Farmers' practice	112.8	250	79	19.51	4.29
SE	0.37	2.19	1.05	0.61	0.09
LSD _(0.05)	0.76	4.49	2.17	2.24	0.13

Table 2: Effect of location on grain yield of T. Aman rice, 2015 in Barisal region of Bangladesh (on an average of three treatments)

	Plant height (cm)	Panicle per m ²	Grains per panicle	Sterility (%)	Grain yield (t/ha)
Babuganj	107.9	247	71	19.76	3.65
Barisal Sadar	113.0	254	82	16.89	4.65
Nolchiti	114.8	236	85	17.39	4.67
Amtoli	114.2	320	92	16.00	5.58
Kolapara	114.1	305	92	13.89	5.16
SE	0.47	2.83	1.36	0.89	0.07
LSD _(0.05)	0.98	5.79	2.80	2.60	0.11

Panicle per m²

Maximum panicle number per m² (294) was found in USG treatment which is significantly higher than BRRl recommended dose and farmer's practice (Table 1). In Amtoli the highest panicle number per m² (320) was found which was also significantly higher than other locations (Table 2).

The highest panicle per m² (354) found in USG at Amtoli which was significantly higher than Kolapara (326) location. On the other hand, in case of BRRl recommended dose in Amtoli was similar with USG at Kolapara (Table 3). Farmer's practice (220) at Nolchiti showed the lowest panicle per m².

Table 3: Interaction effect of fertilizer application method and location on grain yield of T. Aman rice, 2015 in Barisal region

Treatments	Location	Plant height (cm)	Panicle per m ²	Grains per panicle	Sterility (%)	Grain yield (t/ha)
BRRI recom. dose	Babuganj	108.3	247	71	19.50	3.75
	Barisal Sadar	112.3	257	84	16.67	4.62
	Nolchiti	114.3	236	86	16.80	4.74
	Amtoli	114.7	321	93	14.67	5.74
	Kolapara	113.7	310	95	14.33	5.24
USG + PKSZn	Babuganj	108.0	265	77	15.76	3.99
	Barisal Sadar	112.7	270	87	15.67	4.98
	Nolchiti	115.3	252	88	14.68	5.24
	Amtoli	114.7	354	96	14.33	5.84
	Kolapara	115.0	326	95	12.00	5.59
Farmer's practice	Babuganj	107.3	231	65	24.00	3.21
	Barisal Sadar	114.0	236	75	18.33	4.36
	Nolchiti	115.0	220	83	20.90	4.05
	Amtoli	113.3	287	89	19.00	5.17
	Kolapara	113.7	278	86	15.33	4.67
SE		0.82	4.89	2.36	1.35	0.12
LSD _(0.05)		1.69	10.03	4.84	2.77	0.18

Grains per panicle

Significant differences were observed among the treatments (Table 1) and the highest grains per panicle were found in both Amtoli and Kolapara than other locations (Table 2). [10, 13] also found that application of urea super granule had the highest grains per panicle than prilled urea application.

The highest grains per panicle (96) were found in Amtoli with USG treatment. Similar results were found in both Amtoli and Kolapara with BRRI recommended dose and in Kolapara with USG treatment (Table 3). Significantly the lowest number of grains per panicle (65) found in farmers' practice in Babuganj.

Percent of sterility

The percent sterility was observed the highest in farmer's practiced plot and the lowest of that was observed in USG treated plot (Table 1). Among the location percent of sterility was significantly the highest in Babuganj and the lowest of that was in Kolapara (Table 2).

The lowest percent of sterility (12.00) was found in USG treated plot in Kolapara which was also similar in Nolchiti and Amtoli. On the other hand with BRRI recommended dose in Amtoli and Kolapara was also similar with the lowest percent of sterility. The highest percent of sterility (24.00) showed in farmer's practice treatment in Babuganj (Table 3).

Grain yield of rice

Grain yield was increased with USG application and showed significantly the highest grain yield in Nolchiti and lowest of that in farmer's practiced plot (Table 1) and Amtoli showed the highest yield over

other locations (Table 2). [10, 13] also found that application of urea super granule had the highest grain yield than prilled urea application.

The USG plot gave the highest grain yield (5.84 t/ha) at Amtoli which was similar with BRRI recommended dose (5.74 t/ha) at same location. The lowest yield (3.21 t/ha) was found in farmer's practice at Babuganj (Table 3).

CONCLUSION

From the above stated results and discussions it can be concluded that, USG performed the best in respect of grain yield and other yield contributing characters irrespective of prilled urea broadcasting and farmer's practice in all locations. These might be happened due to uniform placement of N in the root zone in case of USG application than prilled urea broadcasting. Hence, it can be recommended that farmers could be use USG in tidal non-saline flooded ecosystem of Barisal region in T. Aman season for boosting up their rice production with comparable cost of production.

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