Research in
ISSN : P-2409-0603, E-2409-9325
AGRICULTURE, LIVESTOCK and FISHERIES
An Open Access Peer-Reviewed International Journal

Article Code: 0348/2021/RALF
Article Type: Research Article

Res. Agric. Livest. Fish.
Vol. 8, No. 3, December 2021: 281-289.

EFFECT OF VARIETY AND NITROGEN FERTILIZER MANAGEMENT ON THE GROWTH AND YIELD OF TRANSPLANT *AMAN* RICE

Tanjida Afrin Chhanda[1], Md. Abdur Rahman Sarkar[1], Suriaya Perveen[1], Md. Mosharaf Hossain[2] and Ahmed Khairul Hasan[1]*

[1]Department of Agronomy, Bangladesh Agricultural University, Mymensingh-2202; [2]Mouza and plot based National Digital Land Zoning Project, Ministry of Land Bhumi Bhaban (12th floor), 98, Shaheed Tajuddin Ahmed Sarani Tejgaon, Dhaka-1208, Bangladesh.

***Corresponding author:** Ahmed Khairul Hasan; E-mail: akhasan@bau.edu.bd

ARTICLE INFO

Received
05 December, 2021

Revised
17 December, 2021

Accepted
19 December, 2021

Online
31 December, 2021

Key words:

T. *aman* rice
Nitrogen
Variety
Growth
USG

ABSTRACT

Varietal selection and appropriate placement of nitrogen fertilizer could reduce the magnitude of nitrogen losses to a considerable extent and improve its use efficiency for better grain production. An experiment was carried out during the period from July to December at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh to evaluate the effect of variety and nitrogen fertilizer management on the growth and yield of transplant *aman* rice. The treatments consisted of three varieties viz. BR11, BRRI dhan49 and Binadhan-7, and five nitrogen fertilizer managements viz. two depth of placement of USG (Urea Super Granule) and three split applications of prilled urea. The experiment was laid out in a randomized complete block design with three replications. The results showed that the effect of variety and nitrogen fertilizer management significantly influenced all the yield contributing characters except weight of 1000-grains, non-effective tillers hill^{-1} and panicle length. The highest grain yield (3.69 t ha^{-1}) was obtained from Binadhan-7. In the case of nitrogen fertilizer management, the highest grain yield (4.32 t ha^{-1}) was found from the 6 cm depth placement of USG. The highest grain yield (4.82 t ha^{-1}) was observed from the interaction of Binadhan-7 with the 6 cm depth of placement of USG. It may be concluded that Binadhan-7 with 6 cm depth of placement of USG appeared as the promising practice to maximize the yield of transplant *aman rice.*

To cite this article: Chhanda T.A., M. A. R. Sarkar, S. Perveen, M. M. Hossain and A. K. Hasan, 2021. Effect of variety and nitrogen fertilizer management on the growth and yield of Transplant *aman* rice. Res. Agric. Livest. Fish., 8 (3): 281-289.

INTRODUCTION

Rice (*Oryza sativa*) is the major food crop of Bangladesh covering about 80% of total cropped area. The area and production of rice in Bangladesh are about 11.42 million ha and 36.60 million tons, respectively. Transplant *aman* covers the largest area; it occupies about 49% of total cultivable land area (BBS, 2021). Although, rice is the staple food of the people of our country is much lower than the world average production of rice. The reasons may be varietals, climatic or technological. Variety as well as rate and depth of placement of urea supper granules (USG) and split application of prilled urea can play a significant role in increasing yield of rice. Variety is the most important factor in rice cultivation. It is a genetic factor which contributes a lot in yield and yield components of a particular crop (Mahmud et al*.,* 2013). Variety has marked influence on number of tillers, 1000-grain weight, filled grain percentage which ultimately influences yield of rice. Use of high yielding variety has been increased remarkably in recent years and the country has almost reached a level of self-sufficiency in food. Selection of potential variety, planting in appropriate method and application of optimum amount of nutrient elements can play important role in increasing yield of rice and national income.

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 (Saleque et al., 2004). Use of fertilizer is an essential component of modern farming with about 50% of the world crop production (Pradhan, 1992).The application of fertilizer in proper amount must be done to boost up agricultural production to an economically desirable level. According to Crasswell and De Datta (1980) broadcast application of urea on the surface soil causes losses upto 50% but point placement of urea supper granules (USG) in 10 cm depth may result in negligible loss. USG is a fertilizer that can be applied in the rice root zone at 8-10 cm depth of soil (reduced zone of rice soil) which can save 30% N than prilled urea, increase absorption rate, improve soil health and ultimately increase the rice yield. Using full dose of USG with other inorganic fertilizers showed the best yield performance (Kabir et al., 2010). The recent literatures on nitrogen use efficiency of rice, in general, would indicate the superiority of root zone placement of urea supper granules as it could reduce the magnitude of nitrogen losses to a considerable extent and improve its use efficiency for better grain production (Crasswell and De Datta, 1980). Therefore, the present study was undertaken to find out the suitable variety and the optimum dose and depth of prilled urea required achieving the maximum yield of transplant *aman* rice.

MATERIALS AND METHODS

Study area

The experiment was conducted from July to December at the Agronomy Field, Laboratory, Bangladesh Agricultural University, Mymensingh to study the effect of variety and nitrogen fertilizer placement. The field belongs to the Agro-ecological region of the old Brahmaputra Flood plain (AEZ-9) (UNDP and FAO, 1988) and the soil of the site belongs to the Sonatola series of the dark grey flood plain soil under the old Brahmaputra Alluvial Tract. The field was medium high land with silty clay loam soil having pH value of 6.5. The climate was characterized by high temperature, high humidity and heavy rainfall in April-September (Kharif season) and scanty rainfall associated with moderately low temperature during October-March (Rabi seasons).

Experimentation and crop husbandry

The study was consisted three varieties viz.V_1 = BR 11, V_2 = Binadhan-7 and V_3=BRRI dhan 49 and five nitrogen fertilizer managements viz. F_1 =Two splits of prilled urea – $^1/2$ as basal + $^1/2$ at maximum tillering (MT), F_2=Three splits of PU - 1/3 as basal + 1/3 at MT + 1/3 at panicle initiation (PI), F_3=Two splits of PU - at 15 days after transplanting(DAT) + 1/2 MT, F_4= Urea super granules (USG) (1.8g) placed at 6 cm depth, and F_5= Urea super granules (USG)(1.8g) placed at 8 cm depth. It was laid out in a randomized complete block design with 3 replications. The size of the unit plot was $10m^2$ (4.0m x 2.5m) and was separated by 0.5 m wide bund.

Seeds of rice varieties were collected from the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh. The seeds were sown in the nursery bed on July. After the final land preparation, the field layout was made as per the design. Fertilizers were applied to the plots @ 120, 60, 40 and 10 kg ha^{-1} of triple super phosphate, muriate of potash, gypsum and $ZnSO_4$, respectively. All the fertilizers were applied by broadcasting and incorporated into the soil at the time of final land preparation. Prilled urea (45.5 kg N ha^{-1}) was applied as per treatment. Urea super Granules (USG) (1.8 g) were placed at depth of 6 cm and 8 cm at the centre of four hills of two adjacent rows at 10 days after transplanting (DAT) in the specific plots. Thirty-day old seedlings were transplanted in the well puddled experimental plots on 15 August.

Seedlings in some hills died off and these were replaced by gap filling after one week of transplanting with seedlings from the same source. Three hand weedings were done at 15, 30 and 45 DAT to control the weeds. Experimental plots were irrigated as and when needed. Excess water was drained out of the plots before 15 days of harvest to enhance maturity of the crop. The crop was harvested on 18 December at full maturity.

Collection of data

Five hills (excluding border hills) were selected randomly from each unit plot and uprooted before harvesting for recording necessary data. After sampling, 5m^{2}from the middle of each unit plot were harvested at maturity. The harvested crop of each plot was separately bundled, properly tagged and then brought to the threshing floor. The grains were cleaned and sun dried to a moisture content of 14%. Straws were also sun dried properly. Finally grain and straw yields plot^{-1} were recorded and converted to t ha^{-1}.

Statistical analysis

The collected data were analyzed statistically following the analysis of variance (ANOVA) technique and significance of the mean differences were adjudged by Duncan's Multiple Range Test (DMRT) using a statistical computer package programme MSTAT-C.

RESULTS

Crop characters at different growth stages

Plant height and numbers of tillers hill^{-1} were significantly influenced by variety and nitrogen management at different crop growth stages (Figure 1, Figure 2 and Table 1). It was found that BRRI dhan49 produced the tallest plant (91.12cm) at 75 DAT which was statistically identical to Binadhan-7 (Figure 1). The shortest plant was found in BR11 (80.06 cm) at 75 DAT. It is observed that number of tillers hill^{-1} was significantly affected by variety. Binadhan-7 produced the highest number (10.31) of tillers hill^{-1} and the lowest number (9.22) of tillers hill^{-1} was obtained from BR11 (Figure 1).

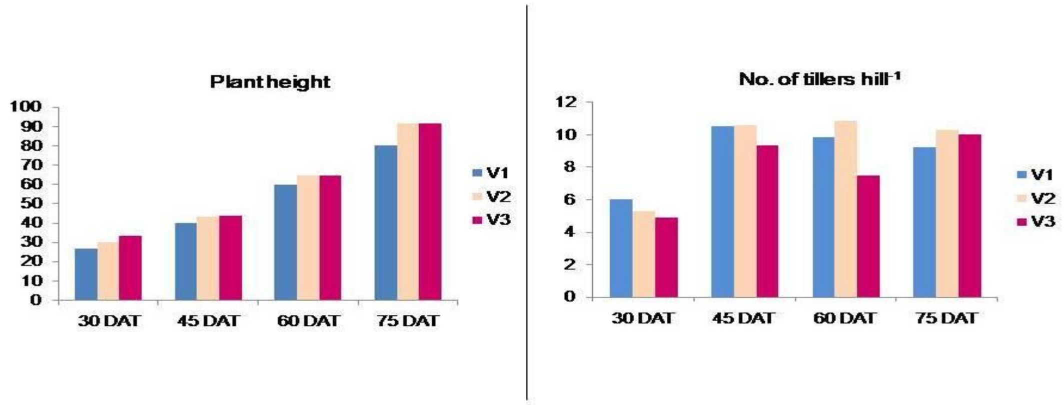

Figure 1. Effect of variety on plant height and number of tillers hill^{-1} of transplanted *aman* rice at different crop growth stages (Here, V_1 = BR11, V_2 = Binadhan-7 and V_3 = BRRI dhan49)

Different nitrogen managements had significant influence on growth characters of T. *aman* rice at different growth stages (Figure 2). At 30DAT, the tallest plant was observed in three split applications of prilled urea (1/3 as basal + 1/3 at maximum tillering (MT) + 1/3 at panicle initiation (PI)). The highest plant height was found (88.24cm) at 6 cm depth placement of USG at 75 DAT and the lowest plant height (87.16cm) was found at 8 cm depth placement of USG (Figure 2). At 75 DAT the maximum of number tillers hill^{-1} (11.16) was obtained at 6 cm depth placement of USG followed by two split applications of prilled urea and the lowest number of tillers hill^{-1} (8.10) was obtained at 8 cm depth of placement of USG (Figure 2).

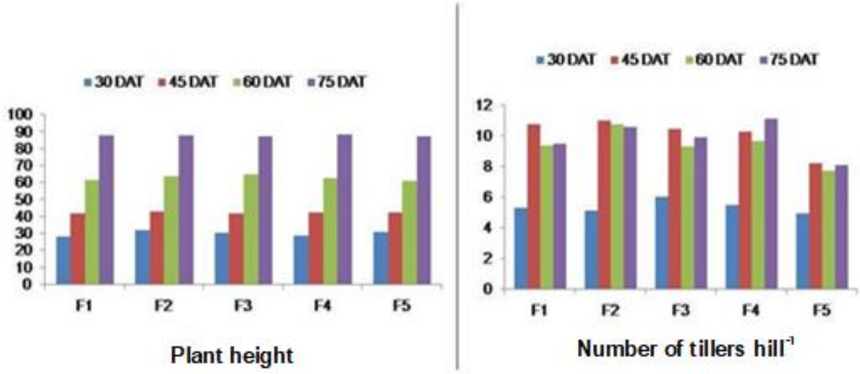

Figure 2. Effect of nitrogen management on plant height and number of tillers hill^{-1} of transplanted *aman* rice at different crop growth stages; Here, F_1 = Two split (1/2 as basal + ½ at maximum tillering (MT)), F_2 = Three split (1/3 as basal + 1/3 at MT + 1/3 at panicle initiation (PI)), F_3 = Two split (1/2 at 15 DAT + ½ at MT), F_4 = 6 cm depth of placement of USG and F_5 = 4 cm depth of placement of USG.

Interaction effect of variety and nitrogen fertilizer management showed significant variation on plant height and number of tillers hill^{-1} (Table 1). At 75 DAT, Binadhan-7 with 6 cm depth of placement of USG was produced the tallest plant (93.50cm) and the shortest plant was recorded in the interaction of two split applications of prilled urea (1/2 at 15 DAT + 1/2 at MT) with BR11 (79.23cm) (Table 1).Interaction of Binadhan-7 with three split (1/3 as basal + 1/3 at MT) application of prilled urea was produced the highest number (12.83) of tillers hill^{-1}at 75 DAT and the lowest number (6.67) of tillers hill^{-1}was observed by Binadhan-7 with 8 cm depth of placement of USG (Table 3).

Crop characters, yield and yield attributes during harvest

Crop characters and yield of T. *aman* rice was significantly affected by variety (Table 2). BR11 produced the highest plant height (102.20 cm), which was similar to BRRI dhan49 (101.23 cm) and the lowest plant height was found in Binadhan-7 (81.20 cm) (Table 2). Results revealed that number of total tillers hill^{-1} significantly differed due to variety. The highest number of total tillers hill^{-1} (12.91), number of effective tillers hill^{-1} (10.62) and number of grains panicle^{-1} (111.77) were produced by Binadhan-7 and the lowest number of total tillers hill^{-1} (9.41), number of effective tillers hill^{-1}(6.95) and number of grains panicle^{-1} (93.56)were produced by BRRI dhan49 (Table 2). Production of non-effective tillers hill^{-1}, panicle length and 1000-grain weight were not significantly influenced by variety. The most number of non-effective tillers was found in hill^{-1}(2.46) BRRI dhan49 and the lowest number of non-effective tillers hill^{-1} was obtained from BR11 (2.27) (Table 2). The results showed that numerically BR11 produced the longest panicle (22.94 cm) and Binadhan-7 apparently produced the highest 1000-grain weight (23.31) followed by BR11 and BRRI dhan49 (22.92) (Table 2). Sterile spikelets panicle^{-1} was significantly influenced by variety. The result indicated that highest number of sterile spikelets panicle^{-1} was obtained from BR11 followed by BRRI dhan49 and Binadhan-7 was statistically identical regarding number of sterile spikelets panicle^{-1} (Table 2). Variety had highly significant effect on yield. The results showed that the variety Binadhan-7 produced the highest grain yield (3.69 t ha^{-1}) and straw yield (4.70 t ha^{-1}). However, BR11 showed the lowest result regarding yield (Table 2). The highest biological yield (8.39 t ha^{-1}) was found in Binadhan-7. However, BR11 and BRRI dhan49 were statistically identical regarding biological yield (Table 2). The highest harvest index was observed in BR11 (45.24%) followed in order by Binadhan-7 and BRRI dhan49 (Table 2).

The tallest plant (96.29cm) was obtained from 8 cm depth of placement of USG than 6 cm (93.96cm) depth of placement of USG (Table 3). The highest total number of tillers hill^{-1} (12.52) and number of effective tillers hill^{-1} (10.90) was found at the depth of 6 cm of USG. The lowest number of total tillers hill^{-1} (8.78) and effective tillers hill^{-1} (5.54) was found from two split applications of prilled urea (1/2 as basal + 1/2 at MT) (Table 3). Split application of prilled urea and depth of placement of USG had highly significant influence on the number of grains panicle^{-1}. The results indicated that the higher number(113.78) of grains panicle^{-1}was produced from 6 cm depth of placement of USG and the lowest number (93.56) of grains panicle^{-1}was produced from two split (1/2 at 15 DAT + ½ at MT) application of prilled urea (Table 3). The maximum number of sterile spikelets panicle^{-1} (20.78) was found from two splits (1/2 at 15 DAT + 1/2 at MT) application of prilled urea and the lowest one (10.43) was found from 6 cm depth of placement of USG (Table 3).

Table 1. Interaction effect of variety and nitrogen fertilizer management on growth of T. *aman* rice

Interaction	Plant height (cm)				No. of tillers hill^{-1}			
	30 DAT	45 DAT	60 DAT	75 DAT	30 DAT	45 DAT	60 DAT	75 DAT
V_1F_1	24.57e	38.17c	57.49g	80.48e	6.93b	13.07a	10.93b	8.27g
V_1F_2	30.41bed	42.93ab	62.92b-e	80.28e	5.07cd	10.67cd	11.07b	9.47-g
V_1F_3	27.41cde	40.02c	62.08de	79.23e	8.27a	10.93bdc	10.13bc	9.60d-g
V_1F_4	26.38de	39.10c	60.24ef	81.02e	5.53cd	10.67cd	9.87bcd	10.06c-f
V_1F_5	24.80e	38.07c	56.30g	79.27e	4.33d	7.47f	7.20f	8.7fg
V_2F_1	27.58cde	44.33ab	60.94ef	91.17bc	4.51d	10.13cd	9.60b-e	9.73d-g
V_2F_2	32.58ab	42.33b	66.77a	91.95abc	5.92bc	12.80ab	14.40a	12.83a
V_2F_3	30.52a-d	43.52ab	65.43a-d	91.47bc	5.47cd	11.47abc	10.93b	10.80bcd
V_2F_4	24.99e	42.65ab	62.55cde	90.20cb	5.56cd	9.33def	11.20b	11.52abc
V_2F_5	32.95ab	43.97ab	66.00abc	92.84ab	5.09cd	9.33def	8.27c-f	6.67h
V_3F_1	31.46bc	43.12ab	66.33ab	91.51bc	4.55d	9.07def	7.73ef	10.53b-e
V_3F_2	32.63ab	43.76ab	61.99de	92.23ab	4.56d	9.60cde	6.93f	9.49d-g
V_3F_3	33.05ab	42.53ab	66.67ab	91.43bc	4.43d	9.07def	6.93f	9.33d-g
V_3F_4	33.53ab	44.81a	65.88abc	93.50a	5.43cd	10.93dcd	8.00def	11.91ab
V_3F_5	34.97a	44.27ab	60.94ef	89.36d	5.47cd	8.00ef	7.73ef	8.93efg
CV%	7.83	2.99	3.19	2.18	11.79	10.58	11.91	9.28
Level of sig.	**	**	**	**	**	**	**	**

Mean value in a column, having the same letter do not significantly whereas mean values with dissimilar letter(s) differ significantly as per DMRT; Here, V_1 = BR11, V_2 = Binadhan-7 and V_3 = BRRI dhan49; F_1 = Two splits (1/2 as basal + ½ at MT), F_2 = Three split (1/3 as basal + 1/3 at MT + 13 at PI), F_3 = Two splits (1/2 at 15 DAT + ½ at MT), F_4 = 6 cm depth of placement of USG and F_5 = 4 cm depth of placement of USG.

** = Significant at 1% level of probability

Table 2. Effect of variety on crop characters, yield and yield components of T. *aman* rice

Variety	Plant height (cm)	Total tillers hill^{-1} (no.)	Effective tillers hill^{-1} (no.)	Non effective tillers hill^{-1} (no.)	Panicle length (cm)	No of grains panicle^{-1}	No of sterile spikelets panicle^{-1}	Weight of 1000 grains (g)	Grain yield (t ha^{-1})	straw yield (t ha^{-1})	Biolo-gical yield (t ha^{-1})	HI (%)
V_1	102	9.54b	7.27b	2.27	22.94	97.99b	19.97a	23.28	3.26ab	3.94b	7.20b	45.24a
V_2	81.20b	12.91a	10.62a	2.29	22.52	111.7a	13.04b	23.31	3.69a	4.26ab	8.39a	43.86b
V_3	101	9.41b	6.96b	2.46	22.03	96.80b	14.81b	22.92	3.16b	4.26ab	7.42b	42.20c
CV (%)	3.05	8.65	12.26	16.34	7.28	2.53	15.4	2.77	6.06	10.97	6.94	7.02
Level of sig.	**	**	**	NS	NS	**	**	NS	**	**	**	*

Mean value in a column, having the same letter do not significantly whereas mean values with dissimilar letter(s) differ significantly as per DMRT; Here, V_1 = BR11, V_2 = Binadhan-7 and V_3 = BRRI dhan49

* = Significant at 5% level of probability; ** = Significant at 1% level of probability; NS = Not significant

Table 3. Effect of nitrogen fertilizer management on crop characters, yield and yield components of T. *aman* rice

Variety	Plant height (cm)	Total tillers hill^{-1} (no.)	Effective tillers hill^{-1}	Non effective tillers hill^{-1} (no.)	Panicle length (cm)	No of grains panicle^{-1}	No of sterile spikelets panicle^{-1}	Weight of 1000 grains (g)	Grain yield (t ha^{-1})	straw yield (t ha^{-1})	Biological yield (t ha^{-1})	HI (%)
F1	96.29	8.78d	5.45d	3.32	22.71	97.34b	19.09a	23.34	2.51e	3.48c	5.99c	41.36c
F2	93.69	11.57b	9.59b	1.98	22.36	111.75a	11.30b	23.11	3.89b	4.54ab	8.43	46.36b
F3	93.47	10.23c	7.80c	2.43	22.92	93.56c	20.78a	23.36	3.18c	4.29b	7.48b	42.73c
F4	96.14	12.52a	10.90a	1.62	22.49	113.78a	10.43b	2294	4.32a	4.23b	8.55a	51.17a
F5	94.81	10.01c	7.65c	2.36	22.01	94.51c	18.12a	23.11	2.94d	4.95a	7.88b	37.22d
CV (%)	3.05	8.65	13.26	16.34	7.28	2.53	15.4	2.77	6.06	10.97	6.94	7.02
Level of Sig.	NS	**	**	**	NS	**	**	NS	**	**	**	**

Mean value in a column, having the same letter do not significantly whereas mean values with dissimilar letter(s) differ significantly as per DMRT ; F_1 = Two split (1/2 as basal + ½ at MT), F_2 = Three split s(1/3 as basal + 1/3 at MT + 13 at PI), F_3 = Two splits (1/2 at 15 DAT + ½ at MT), F_4 = 6 cm depth of placement of USG and F_5 = 4 cm depth of placement of USG.
** = Significant at 1% level of probability; NS = Not significant

The highest grain yield (4.32 t ha^{-1}) was produced by 6 cm depth of placement of USG followed by three splits of prilled urea (1/2 as basal + ^{1}/2 at MT+^{1}/2 at PD), two splits application of prilled urea (1/2 as basal + ^{1}/2 at MT). The highest straw yield (4.95 t ha^{-1}) was found from 8 cm depth of placement of USG than that of two splits application of prilled urea (1/2 as basal + ^{1}/2 at MT) (Table 3). A significant variation was found in biological yield due to nitrogen fertilizer management. The highest biological yield (8.55t ha^{-1}) was observed from6 cm depth of placement of USG than that of two splits application of prilled urea (^{1}/2 as basal + ^{1}/2 at MT) (Table 3). The higher harvest index (51.17t ha^{-1}) was observed from 6 cm depth of placement of USG than that of 8 cm depth of placement of USG (Table 3).

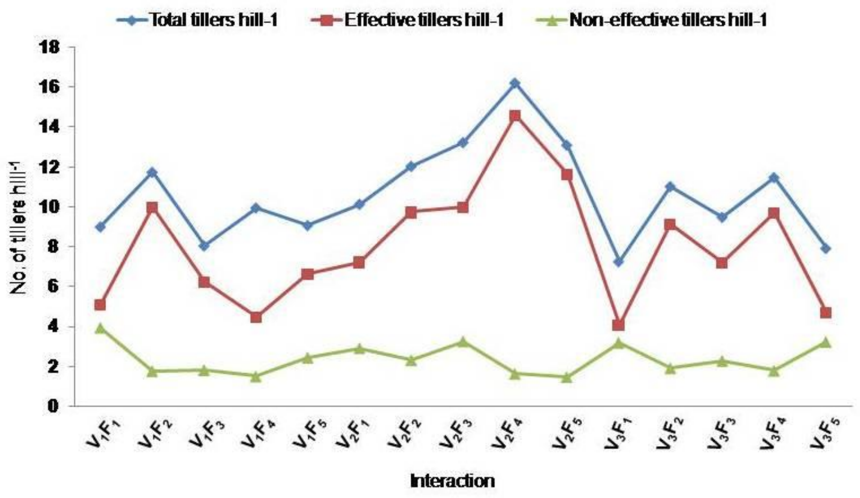

Figure 3. Interaction effect of variety and nitrogen fertilizer management on numbers of tillers hill^{-1} of T. *aman* rice

Here, V_1 = BR11, V_2 = Binadhan7 and V_3 = BRRI dhan49; F_1 = Two splits (1/2 as basal + ½ at MT), F_2 = Three splits (1/3 as basal + 1/3 at MT + 13 at PI), F_3 = Two splits (1/2 at 15 DAT + ½ at MT), F_4 = 6 cm depth of placement of USG and F_5 = 4 cm depth of placement of USG.

The effect of interaction of variety and nitrogen fertilizer management had no significant effect on plant height. The tallest plant (104.57cm) was obtained in the interaction of BR11 with two split applications of prilled urea (1/2 as basal + 1/2 at MT) and the shortest one (80.28cm) was found from the Binadhan-7 with two split application of prilled urea (1/2 as DAT + 1/2 at MT) (Table 4). The highest number of total tillers hill (16.18) and number of effective tillers hill^{-1} (14.57) was found from the interaction of Binadhan-7 with 6 cm depth of placement of USG and the lowest number of total tillers hill^{-1} (7.24) and number of effective tillers hill^{-1} (4.07) was found from the interaction of BRRI dhan49 with two split (1/2 at basal + ^{1}/2 at MT) application of prilled urea (Figure 3). The maximum number of non-effective tillers hill^{-1} (3.91) was obtained in the interaction of BR11 with two split (1/2 as basal + 1/2 at MT) application of prilled urea.

Table 4. Interaction effect of variety and nitrogen fertilizer management on crop characters, yield and yield components of T. *aman* rice

Interaction (VxF)	Plant height (cm)	Panicle length (cm)	No of grains hill^{-1}	No. of sterile spikelets	Weight of 1000 grains (g)	Grain yield (t ha^{-1})	straw yield (t h^{-1})	Biological yield (t ha^{-1})	HI (%)
V_1F_1	104.57	23.10	100.45c	27.20a	23.41	2.52h	3.22ef	5.7e	43.82e-f
V_1F_2	101.89	22.83	102.46c	12.10de	23.31	3.92bc	3.90def	7.82ed	50.16b
V_1F_3	99.20	22.77	99.17cd	22.90ab	23.51	2.98fg	4.32bed	7.30ed	40.98efg
V_1F_4	104.57	23.18	102.46c	12.10de	22.88	4.22b	3.22ef	7.44ed	56.94a
V_1F_5	100.77	22.83	85.40fg	25.57a	23.31	2.65gh	5.06ab	7.70ed	34.29h
V_2F_1	81.62	22.03	92.33e	19.00be	23.14	3.26ef	4.05e-f	7.31ed	44.66b-e
V_2F_2	80.59	22.83	116.22b	11.27de	23.28	4.14b	5.06ab	9.20b	45.00b-e
V_2F_3	80.28	23.83	95.37de	16.03cd	23.86	3.15ef	4.00e-f	7.15d	44.30ede
V_2F_4	81.49	22.03	138.05a	8.57e	23.14	4.82a	5.41a	10.23a	47.14bed
V_2F_5	102.70	21.87	116.90b	10.35de	23.14	3.07ef	4.97ab	8.04ed	38.22fgh
V_3F_1	82.70	23.00	99.24cd	11.08de	23.47	1.76i	3.17f	4.92e	35.61gh
V_3F_2	98.57	21.40	116.58b	10.53de	22.75	3.62cd	4.66a-d	8.28e	43.92e-f
V_3F_3	100.93	22.17	86.15f	23.40ab	22.71	3.41de	4.56a-d	7.98ed	42.90def
V_3F_4	102.36	22.27	100.82c	10.62de	22.80	3.93bc	4.07cde	7.99ed	49.42be
V_3F_5	101.61	21.33	81.23g	18.43bc	22.87	3.09ef	4.81abc	7.90ed	39.15e-h
CV (%)	3.05	7.28	2.53	15.4	2.77	6.06	10.97	6.94	7.02
level of sig.	NS	NS	**	**	NS	**	**	**	**

Mean value in a column, having the same letter do not significantly whereas mean values with dissimilar letter(s) differ significantly as per DMRT ; Here, V_1 = BR11, V_2 = Binadhan7 and V_3 = BRRI dhan49; F_1 = Two splits (1/2 as basal + ½ at MT), F_2 = Three splits (1/3 as basal + 1/3 at MT + 13 at PI), F_3 = Two split (1/2 at 15 DAT + ½ at MT), F_4 = 6 cm depth of placement of USG and F_5 = 4 cm depth of placement of USG.
** = Significant at 1% level of probability; NS = Not significant

The results showed that the interaction effect of variety and nitrogen fertilizer management had no significant influence on the panicle length and 1000-grain weight (Table 4). However, numerically the longest panicle (23.83 cm) and maximum 1000-grain weight (23.86 g) was obtained from the interaction of binadhan-7 with two split (1/2 at 15 DAT+^{1}/2 at MT) application of prilled urea. The highest number of grains hill^{-1} (138.05) was found from the interaction of Binadhan-7 with 6 cm depth of placement of USG and the lowest one was found (81.23) from the interaction of BRRI dhan49 with 8 cm depth of placement of USG (Table 4). BR11 with two split (1/2 as basal + 1/2 at MT) application of prilled urea produced the highest number (27.20) of sterile spikelets panicle^{-1} and the lowest one (8.57) was produced from the interaction of Binadhan-7 with 6 cm depth of placement of USG (Table 4).

The highest grain yield (4.82 t ha^{-1}), straw yield (5.41t ha^{-1}) and biological yield (10.23 t ha^{-1}) was found in the interaction of Binadhan-7 with 6 cm depth of placement of USG. The lowest grain yield (1.76 t ha^{-1}) and straw yield (3.17 t ha^{-1}) was found in the interaction of BRRI dhan49 with two split (1/2 at basal + ^{1}/2 at MT) application of prilled urea (Table 4). Harvest index of T. *aman* rice showed the highest result (56.94%) in the interaction of BR11 with 6 cm depth of placement of USG and the lowest one (34.29%) was found in the interaction of BR11 with 8 cm depth of placement of USG (Table 4).

DISCUSSION

Variety and nitrogen fertilizer management had significant influence on T. *aman* rice. Plant characters like plant height and number of tillers hill^{-1} showed significant variation at different growth stages. The highest results was found in 75 DAT and this results collaborates the findings of Kirttania et al. (2013), Azam et al. (2012) and Vijaya and Subbaiah (1997).Varietal difference may due to different genetic makeup and variation among different nitrogen managements may due to nitrogen availability at different nitrogen application methods. Most of the plant characters like plant height, effective tillers hill^{-1}, number of grains panicle^{-1}, number of grains hill^{-1} showed the highest performance in the interaction of Binadhan-7 with 6 cm depth of placement of USG. Those result partially similar with the findings of Mohammad *et al.* (2014) and Hasan et al. (2002). USG method showed better result than split application of urea due to less nutrient loss and more availability of nitrogen for plant. The highest number of effective tillers hill^{-1}, number of grains panicle^{-1} and the highest 1000-grain weight were responsible for the highest yield. Depth of placement of USG and split application of prilled urea show significant variation on total number of effective tillers hill^{-1}.The highest grain yield in USG placement at 6 cm occurred due to the highest number of grains panicle and the highest number of effective tillers hill^{-1}. Nitrogen fertilizer management had also highly significant influence on the number of straw yield. Similar results were recorded by Hasanuzzaman et al., 2009. The highest grain yield and straw yield subsequently results the highest biological yield and harvest index.

CONCLUSION

The results of the present study suggest that transplanting of Binadhan-7 in combination with 6 cm depth of placement of USG appeared as the promising practice in transplant *aman* rice cultivation and binadhan-7 was found to be promising rice variety in terms of grain yield.

COMPETING INTEREST

The authors declare that there is no conflict of interests regarding the publication of this paper.

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