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Impact of variety and levels of nitrogen on the growth performance of HYV transplant Aman rice

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Abstract

An experiment was carried out at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh during June to December 2012 with a view to finding out the impact of variety and levels of nitrogen on the growth performance of transplant *Aman* rice. The experiment comprised four varieties viz. BRRI dhan33, BRRI dhan34, BRRI dhan39 and BRRI dhan46, and four levels of nitrogen viz. control (no urea), prilled urea (50 kg N ha^{-1}), one pellet (0.9g) of USG/4 hills of two adjacent rows ($\cong$ 30 kg N ha^{-1}) was applied at 10 days after transplanting (DAT) and two pellets of USG (0.9g each) one applied at 10 DAT and the another at 45 DAT/4 hills of two adjacent rows ($\cong$ 60 kg N ha^{-1}). The experiment was laid out in a randomized complete block design with three replications. Results of the experiment showed that variety and levels of nitrogen had significant effect on plant height, number of tillers $hill^{-1}$ and leaf area index (LAI) of HYV transplant *Aman* rice. At 15 and 75 DAT the tallest plant was found in BRRI dhan34 whereas at 30, 45 and 60 DAT the tallest plant was found in BRRI dhan39. BRRI dhan34 produced higher number of tillers $hill^{-1}$ at 75 DAT which was as good as BRRI dhan33 and BRRI dhan46 while BRRI dhan39 produced higher LAI in compare to other varieties at all sampling dates. Two pellets of USG (0.9g each) one applied at 10 DAT and the another at 45 DAT/4 hills of two adjacent rows ($\cong$ 60 kg N ha^{-1}) can produced tallest plant, higher number tillers $hill^{-1}$ and higher LAI at all dates of sampling. Among the interaction BRRI dhan34 fertilized with two pellets of USG (0.9g each) one applied at 10 DAT and another at 45 DAT/4 hills of two adjacent rows ($\cong$ 60 kg N ha^{-1}) appears as the promising combination in respect of growth performance of HYV transplant *Aman* rice.

Key words: Variety, nitrogen, growth, HYV, transplant aman rice.

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Introduction

Rice (*Oryza sativa* L.) is the most important cereal and staple food crop of Bangladesh. There are three distinct growing seasons of rice according to changes in seasonal conditions as *Aus*, *Aman* and *Boro*. Among them, the largest harvest is obtained from *Aman,* occurring in November and December accounting for more than half of the area coverage. *Aman* rice covers the largest area of 5.64 million hectares with a production of 12.70 million tons of rice (BBS, 2011). Depletion of soil fertility has been identified as a major constraint for higher crop yield in Bangladesh. Use of judicial application of fertilizer is an essential component of modern farming with about 50% of the world crop production (Prodhan, 1992). For rice production, nitrogen is the key nutrient required in the largest quantities while urea is the principal nitrogenous fertilizer. However, N from urea is subject to considerable losses to the atmosphere and runoff water in the rice ecosystem, especially where urea is broadcast on standing water. On a global level, more than 55 percent of the N applied through urea fertilizer to irrigated rice is not taken up and eventually liable to loss. In Bangladesh, prilled urea (PU) conventionally applied by farmers is very inefficiently used in transplant *Aman* rice largely because of serious losses (up to 60% of applied N) via NH_3 volatilization, denitrification, leaching, and/or runoff. In order to minimize N loss, especially loss due to denitrification, use of USG in place of prilled urea is very beneficial for transplant *Aman* rice. USG can be prepared by melt-type processes (pan granulation, falling curtain, and fluid bed) and briquetting (a special type of compaction). Placement of USG can be done efficiently by hand near the center of each four rice hills to a 7-10 cm soil depth. The deep-placed USG-N is well protected from various N loss mechanisms (except leaching) at the placement sites in soils and the spatial ammonium concentration gradients help to improve its plant availability. Depending on agro climate and N rates used, in general deep-placed USG can help to provide a saving of urea fertilizer of up to 65% with an average of 33% and can help to increase grain yields up to 50% with an average of 15% to 20% over that with the same amount of split-applied N as prilled urea. Plant growth is seriously hampered when lower dose of N is applied which drastically reduces the yield (Khatab *et al.,* 2013). However, excess amount of N-fertilizer also results in lodging of plants, prolonging growing period, delayed in maturity, increased the susceptibility to insect-pest and diseases and ultimately reduces yield (Uddin, 2003). Therefore, optimum dose of N-fertilizer application and its efficient management are necessary to proper growth of rice which is prerequisite for grain yield. Based on the above information, the study was undertaken to investigate impact of levels of nitrogen on the growth performance of HYV transplant Aman rice.

Materials and Methods

The experiment was conducted at the Agronomy Field laboratory, Bangladesh Agricultural University, Mymensingh during July to December 2012. The experimental site belongs to the Sonatola Soil Series of Old Brahmaputa Floodplain (AEZ 9) having non calcareous dark grey floodplain soil. The land was medium high with sandy loam texture having pH 5.9-6.5. The experiment consisted of four varieties viz. BRRI dhan33, BRRI dhan34, BRRI dhan39 and BRRI dhan46; and four levels of nitrogen viz. control (no urea), prilled urea (50 kg N ha^{-1}), one pellet (0.9g) of USG/4 hills of two adjacent rows ($\cong$ 30 kg N ha^{-1}) was applied at 10 DAT and two pellets of USG (0.9g each) one applied at 10 DAT and the another at 45 DAT/4 hills of two adjacent rows ($\cong$ 60 kg N ha^{-1}). The experiment was laid out in a randomized complete block design with three replications. The size of unit plot was 4.0m × 2.5m. Spacing of 1m and 0.75m were maintained in between the replications and unit plot, respectively. Fertilizers were applied to the plots at the rate of 90, 60, 40 and 10 kg ha^{-1} of P_2O_5, K_2O, S and Zn through triple super phosphate, muriate of potash, gypsum and zinc sulphate at the time of final land preparation. Prilled urea was applied at the rate of 50 kg N ha^{-1} in three installments at 15, 30 and 45 DAT. As per experimental specification USG were placed manually (depth 6-8 cm) at the centre of four hills of two adjacent rows at 10 days after transplanting (DAT). In case of twice, USG was placed at 10 DAT and 45 DAT. Five hills were marked by bamboo stick excluding boarder rows to collect data on plant height and tiller number. Five hills were destructed every sampling dates for leaf area index . Data on crop growth parameters viz. plant height, number of tillers $hill^{-1}$ and leaf area index were taken at intervals of 15 days at 15, 30, 45, 60 and 75 DAT. The leaf area was measured by an automatic leaf area meter (Type AAN-7, Hayashi Dam Ko Co., Japan). Leaf area index was calculated as the ratio of total leaf area and total ground area of the sample as described by Hunt (1978).

$$LAI = LA/P$$

Where,

LAI = Leaf area index

LA = Total leaf area of the leaves of all the sampled plants (cm^2)

P = Area of the ground surface covered by the plant (cm^2)

The recorded data were statistically analyzed using the "Analysis of Variance" technique and the differences among treatment means were adjudged by Duncan's New Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

Impact of variety

Growth parameters viz. plant height, number of tillers hill^{-1} and leaf are area index (LAI) were influenced by variety. Plant height in all the varieties increased progressively with the advancement of time from 15 to 75 DAT. BRRI dhan34 showed superiority in plant height followed by BRRI dhan39, BRRI dhan46 and BRRI dhan33 (Table 1).

Table 1. Effect of varieties on plant height at different day after transplanting

Variety	Plant height (cm)				
	Days after transplanting (DAT)				
	15	30	45	60	75
BRRI dhan33	25.01d	44.58b	69.00c	93.33b	98.66d
BRRI dhan34	31.42a	50.57a	72.37b	86.13c	122.60a
BRRI dhan39	29.61b	50.88a	74.64a	99.47a	109.37b
BRRI dhan46	28.16c	45.17b	70.96b	95.06b	105.13c
CV (%)	5.41	3.38	3.49	4.05	4.14
Level of Sig.	**	**	**	**	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, **= Significant at 1% level of probability

Varietal differences regarding plant height might be due to their differences in genetic constitution. Similar results were reported elsewhere (Ray *et al*., 2015; Kirttania *et al.* 2013; Tyeb *et al*., 2013 and BRRI, 1991 and Shamsuddin *et al*., 1988). Number of total tillers hill^{-1} was significantly influenced by variety at all dates of transplanting (Table 4). The number of tillers hill^{-1} increased in all the varieties from 15 to 60 DAT but it decreased in all the varieties at 75 DAT. The highest number of tillers hill^{-1}was produced by BRRI dhan34 which was as good as BRRI dhan46 and BRRI dhan33 and the lowest one in BRRI dhan39. Jisan *et al*. (2014) and Kirttania *et al.* (2013) found variable effect of variety on number of tillers hill^{-1}. The variety had significantly effect on leaf area index on 30 DAT and 45 DAT. Both BRRI dhan39 and BRRI dhan33 showed superiority over BRRI dhan46 and BRRI dhan34. Leaf area index gradually increased up to 60 DAT in all varieties and then declined thereafter due to leaf abscission and tiller drying (Table 7). Similar trend of LAI was reported by Paul *et al.* (2013).

Impact of levels of nitrogen

The plant height was significantly influenced due to application of nitrogen level irrespective growth stages. A trend of significant of increase in the plant height was observed with the increase in the level of nitrogen from control to two pellet (s) of USG/4 hills providing 0-60 kg ha^{-1} at all the dates of observation from 15 to 75 DAT (Table 2).

Table 2. Effect of levels of nitrogen on plant height at different days after transplanting

Nitrogen level (kg ha^{-1})	Plant height (cm)				
	Days after transplanting (DAT)				
	15	30	45	60	75
N_0	28.14	47.36	69.96c	90.08c	106.59c
N_1	28.61	47.83	72.34ab	93.23b	108.03bc
N_2	28.43	47.75	71.54b	94.06b	109.77ab
N_3	29.01	48.26	73.13a	96.61a	111.36a
CV(%)	5.41	3.38	3.49	4.05	4.14
Level of Sig.	NS	NS	**	**	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, NS= Not significant, **= Significant at 1% level of probability, N_0 = Control, N_1 = Prilled urea (50 kg N ha^{-1}), N_2 = One pellet (0.9 g) of USG /4 hills of two adjacent rows [applied at 10 DAT], N_3 = Two pellets (0.9 g each) of USG /4 hills of two adjacent rows [One pellet was applied at 10 DAT and another one at 45 DAT

The highest plant height was observed when the plant was fertilized with to two pellet(s) [0.9g each] of USG/4 hills of two adjacent rows and the lowest plant height was recorded in control plots. Application of nitrogen increased plant height was reported elsewhere (Zannat *et al.,* 2014; Jisan *et al.,* 2014; and Kirtannia *et al*., 2013). The effect of nitrogen fertilizer application on the number of total tillers hill^{-1} was significantly influenced at all the dates sampling (Table 5). The number of tillers hill^{-1} increased with the increasing levels of nitrogen from control to two pellet(s) [0.9g each] of USG/4 hills of two adjacent rows providing 0 to 60 kg ha^{-1} respectively. Similar phenomenon was also reported by Kamal *et al*. (1988). Nitrogen level had significant effect on leaf area index (LAI) at all dates of sampling (Table 8). The LAI increased progressively with increase in the level of nitrogen from control to two pellet (s) [0.9g each] of USG/4 hills of two adjacent rows providing 0 to 60 kg ha^{-1} at all the dates of sampling. The LAI increased up to 60 DAT and thereafter declined. Similar finding was also reported by Paul *et al.,* 2014. Ray *et al.* (2015) also stated that high nitrogen levels (80 kg N ha^{-1}) resulted to higher LAI in rice.

Interaction effect

Plant height was significantly influenced by the interaction of variety and nitrogen level only at 45 and 60 DAT. At 15, 30 and 75 DAT, numerically the tallest plant height of 32.18cm, 52.34cm and 123.98 cm were found in the treatment combinations of $V_2 \times N_1$, $V_2 \times N_3$ and $V_2 \times N_3$ and the shortest plant height of 23.93cm, 43.94cm and 95.01cm were found in $V_2 \times N_1$, $V_2 \times N_0$ and $V_1 \times N_0$ respectively (Table 3). A regular trend of increased the plant height in the treatment combinations of all the varieties with the increased in the levels of nitrogen. At 45 DAT showing superiority of BRRI dhan39 and was followed in successive by BRRI dhan34, BRRI dhan46 and BRRI dhan33. But at 60 DAT the trend of increase in plant height was rather irregular in the treatment combinations of varieties with increase in the levels of nitrogen. BRRI dhan34 showed superiority over the treatment combinations of BRRI dhan39, BRRI dhan46, BRRI dhan33 and nitrogen levels. The interaction effect of variety and levels of nitrogen at 30 DAT on numbers of tillers $hill^{-1}$ was significant (Table 6). A trend of increase in the number of tillers $hill^{-1}$ with the increasing levels of nitrogen was observed in all the varieties. The interaction effect of variety and nitrogen level on LAI was significant on all the dates of sampling. A trend of increase in the value of LAI was observed in each variety with the increasing levels of nitrogen (Table 9).

Relationship between leaf area index (LAI) and grain yield of HYV transplant Aman rice

Leaf area index (LAI) is an important character responsible for higher yield. Experimental results revealed that grain yield showed significantly positive correlation (R^2 = 0.7854**) with leaf area index at 75 DAT (Figure 1). This means an increase in leaf area index will result in the corresponding increase in the grain yield of transplant *Aman* rice. Thus indicate leaf area index might be critical characteristics in yield performance of transplant *Aman* rice. Similar trend of relationship of LAI and grain yield of transplant *Aman* rice was reported by Ray *et al.* (2015).

Table 3. Effect of interaction between variety and levels of nitrogen on plant height at different days after transplanting

Interaction (Variety x Nitrogen level)	Plant height (cm)				
	Days after transplanting (DAT)				
	15	30	45	60	75
$V_1 \times N_0$	24.91	44.23	65.41g	86.05e	95.01
$V_1 \times N_1$	24.95	44.95	70.14def	92.22cd	95.96
$V_1 \times N_2$	23.93	45.18	68.91f	95.67abc	101.79
$V_1 \times N_3$	26.26	43.94	71.53def	99.36a	101.90
$V_2 \times N_0$	31.41	49.12	72.47cde	84.79e	122.27
$V_2 \times N_1$	32.18	50.59	72.89bcd	85.80e	123.09
$V_2 \times N_2$	30.89	50.23	71.95c-f	85.91e	121.05
$V_2 \times N_3$	31.22	52.34	72.18c-f	88.02de	123.98
$V_3 \times N_0$	28.02	50.47	70.21def	98.28ab	107.43
$V_3 \times N_1$	29.34	49.97	74.96abc	101.03a	109.99
$V_3 \times N_2$	30.43	50.80	75.93ab	99.11ab	109.61
$V_3 \times N_3$	30.65	52.28	77.46a	99.46a	110.46
$V_4 \times N_0$	28.23	45.61	71.77c-f	91.21cd	101.67
$V_4 \times N_1$	27.97	45.82	71.35def	93.88bc	103.09
$V_4 \times N_2$	28.50	44.78	69.38ef	95.57abc	106.63
$V_4 \times N_3$	27.93	44.47	71.34def	99.59a	109.12
CV(%)	5.41	3.38	3.49	4.05	4.14
Level of Sig.	NS	NS	**	**	NS

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, NS= Not significant, *= Significant at 5% level of probability, **= Significant at 1% level of probability, V_1= BRRI dhan33, V_2= BRRI dhan34, V_3= BRRI dhan39, V_4= BRRI dhan46, N_0 = Control, N_1 = Prilled urea (50 kg N ha^{-1}), N_2 = One pellet (0.9 g) of USG /4 hills of two adjacent rows [applied at 10 DAT], N_3 = Two pellets (0.9 g each) of USG /4 hills of two adjacent rows [One pellet was applied at 10 DAT and another one at 45 DAT]

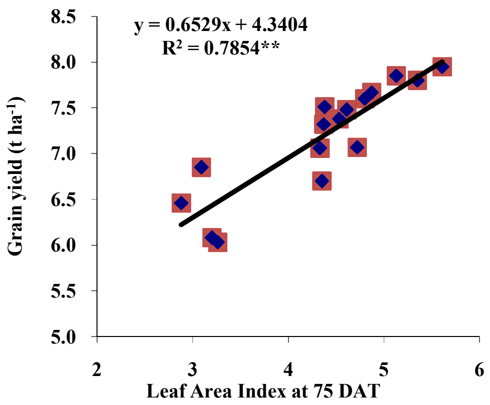

Figure 1. Relationship between leaf area index and grain yield of HYV transplant *Aman* rice at 75 days after transplanting (DAT)

Table 4. Effect of varieties on number of tillers hill^{-1} at different days after transplanting

Variety	Number of tillers hill^{-1} Days after transplanting (DAT)				
	15	30	45	60	75
BRRI dhan33	4.37b	6.46b	9.00b	11.80a	10.90a
BRRI dhan34	4.53ab	7.31a	10.17a	12.19a	11.17a
BRRI dhan39	4.84a	7.67a	10.28a	10.80b	9.78b
BRRI dhan46	4.62ab	7.25a	10.72a	11.98a	10.69a
CV(%)	8.61	12.6	8.26	8.05	8.16
Level of Sig.	**	**	**	**	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, **= Significant at 1% level of probability

Table 5. Effect of levels of nitrogen on number of tillers hill^{-1} at different days after transplanting

Nitrogen level (kg ha^{-1})	Number of tillers hill^{-1} Days after transplanting (DAT)				
	15	30	45	60	75
N_0	4.21c	5.43c	8.31c	8.53	7.05d
N_1	4.50bc	7.39b	9.64b	11.52	10.81c
N_2	4.70ab	7.27b	10.79a	12.73	11.97b
N_3	4.96a	8.59a	11.42a	13.99	12.72a
CV(%)	8.61	12.6	8.26	8.05	8.16
Level of Sig.	**	**	**	NS	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, NS= Not significant, **= Significant at 1% level of probability, N_0 = Control, N_1 = Prilled urea (50 kg N ha^{-1}), N_2 = One pellet (0.9 g) of USG /4 hills of two adjacent rows [applied at 10 DAT], N_3 = Two pellets (0.9 g each) of USG /4 hills of two adjacent rows [One pellet was applied at 10 DAT and another one at 45 DAT

Table 6. Effect of interaction between variety and levels of nitrogen on the number of tillers hill^{-1} at different days after transplanting

Interaction (Variety x Nitrogen level)	Number of tillers hill^{-1} Days after transplanting (DAT)				
	15	30	45	60	75
V_1 x N_0	4.20	4.23a	8.06	7.76	7.33
V_1 x N_1	4.27	7.00ab	8.27	11.68	10.62
V_1 x N_2	4.39	7.00ab	9.51	13.59	12.56
V_1 x N_3	4.62	7.60ab	10.17	14.16	13.11
V_2 x N_0	4.11	5.64ab	8.62	8.60	7.21
V_2 x N_1	4.48	9.60a	9.78	12.51	12.01
V_2 x N_2	4.62	6.60ab	10.82	13.52	12.49
V_2 x N_3	4.92	7.40ab	11.45	14.12	12.99
V_3 x N_0	4.38	7.05ab	8.17	8.69	7.02
V_3 x N_1	4.73	6.95ab	9.80	10.51	9.34
V_3 x N_2	5.07	7.27ab	11.25	11.12	10.66
V_3 x N_3	5.19	9.39a	11.88	12.89	12.09
V_4 x N_0	4.14	4.80b	8.40	9.05	6.64
V_4xN_1	4.53	6.00ab	10.72	11.37	11.25
V_4 x N_2	4.70	8.20ab	11.60	12.68	12.17
V_4 x N_3	5.12	9.98a	12.15	14.80	12.70
CV(%)	8.61	12.6	8.26	8.05	8.16
Level of Sig.	NS	**	NS	NS	NS

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, NS= Not significant, *= Significant at 5% level of probability, **= Significant at 1% level of probability, V_1= BRRI dhan33, V_2 = BRRI dhan34, V_3= BRRI dhan39, V_4= BRRI dhan46, N_0 = Control, N_1 = Prilled urea (50 kg N ha^{-1}), N_2 = One pellet (0.9 g) of USG /4 hills of two adjacent rows [applied at 10 DAT], N_3 = Two pellets (0.9 g each) of USG /4 hills of two adjacent rows [One pellet was applied at 10 DAT and another one at 45 DAT]

Table 7. Effect of varieties on leaf area index at different days after transplanting

Variety	Leaf area index (LAI)				
	Days after transplanting (DAT)				
	15	30	45	60	75
BRRI dhan33	2.02b	4.77c	5.55bc	6.40b	5.39b
BRRI dhan34	1.82c	4.65c	5.38c	5.96c	5.45b
BRRI dhan39	2.18a	5.48a	6.03a	6.88a	5.85a
BRRI dhan46	2.13b	5.28b	5.85b	6.40ab	5.65ab
CV(%)	16.93	17.42	10.42	12.82	10.01
Level of Sig.	**	**	**	**	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, **= Significant at 1% level of probability

Table 8. Effect of levels of nitrogen on the leaf area index at different days after transplanting

Nitrogen level (kg ha^{-1})	Leaf area index (LAI)				
	Days after transplanting (DAT)				
	15	30	45	60	75
N_0	1.57d	3.68c	4.76c	5.88c	4.34c
N_1	2.07c	4.22b	5.50b	6.40b	5.77b
N_2	2.23b	4.95b	5.83b	6.92a	5.87b
N_3	2.38a	5.40a	6.65a	7.17a	6.63a
CV(%)	16.93	17.42	10.42	12.82	10.01
Level of Sig.	**	**	**	**	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, NS= Not significant, ** = Significant at 1% level of probability, N_0 = Control, N_1 = Prilled urea (50 kg N ha^{-1}), N_2 = One pellet (0.9 g) of USG /4 hills of two adjacent rows [applied at 10 DAT], N_3 = Two pellets (0.9 g each) of USG /4 hills of two adjacent rows [One pellet was applied at 10 DAT and another one at 45 DAT

Conclusion

BRRI dhan34 produced tallest plant and higher number of tillers $hill^{-1}$ at 75 DAT while BRRI dhan39 produced higher LAI in compare to other varieties at all dates of sampling. Two pellets of USG (0.9g each) one applied at 10 DAT and the other at 45 DAT/4 hills of two adjacent rows (≅ 60 kg N ha^{-1}) produced the tallest plant, higher number tillers $hill^{-1}$ and higher LAI. It can be concluded that BRRI dhan 34 fertilized with two pellets of USG (0.9g each) one applied at 10 DAT and the another at 45 DAT/4 hills of two adjacent rows (≅ 60 kg N ha^{-1}) appears as the promising combination in respect of growth of HYV transplant *Aman* rice.

Table 9. Effect of interaction between variety and levels of nitrogen on the leaf area index at different days after transplanting

Interaction (Variety x Nitrogen level)	Leaf Area Index (LAI)				
	Days after transplanting (DAT)				
	15	30	45	60	75
V_1 x N_0	1.50	3.34c-f	4.72cd	5.16c-f	6.46def
V_1 x N_1	2.14	3.23bc	5.12bc	5.51c-e	7.51b-e
V_1 x N_2	2.08	2.75bc	4.76b	6.57bc	7.38abc
V_1 x N_3	2.45	2.74def	5.20a	6.67b	7.67c-f
V_2 x N_0	1.58	2.21f	3.20e	5.20c-f	6.03ef
V_2 x N_1	2.02	2.32def	3.70de	5.91c-f	7.06c-f
V_2 x N_2	2.15	3.04def	3.51e	5.46b-f	7.32bc
V_2 x N_3	2.25	3.32ab	5.15bc	5.85b-e	7.95a
V_3 x N_0	1.65	2.28f	3.24e	5.54c-f	6.08c-f
V_3 x N_1	2.08	3.17bc	4.40bc	5.70ab	6.70c-e
V_3 x N_2	2.34	2.29def	3.52de	6.48abc	7.48b-e
V_3 x N_3	2.47	5.00a	5.00c	6.43c-f	7.80ab
V_4 x N_0	1.89	2.62def	3.52e	5.85f	6.85f
V_4 x N_1	3.24	2.26ab	3.88ab	5.17c-f	7.07c-f
V_4 x N_2	2.46	2.14ef	4.77e	5.80a-c	7.60a-d
V_4 x N_3	2.64	2.90b-e	4.04c	6.85a	7.85b
CV(%)	18.93	17.42	10.42	12.82	10.01
Level of Sig.	NS	**	**	**	**

In a column, figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT, NS= Not significant, **= Significant at 1% level of probability, V_1= BRRI dhan33, V_2 BRRI dhan34, V_3= BRRI dhan39, V_4= BRRI dhan46, N_0 = Control, N_1 = Prilled urea (50 kg N ha^{-1}), N_2 = One pellet (0.9 g) of USG /4 hills of two adjacent rows [applied at 10 DAT], N_3 = Two pellets (0.9 g each) of USG /4 hills of two adjacent rows [One pellet was applied at 10 DAT and another one at 45 DAT

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