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Influence of different fertilizer rates on the growth and yield of transplanted *aman* rice genotypes

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Key words: Fertilizer rates, Genotype, Transplanted *aman* rice, Yield, Gross return.

Abstract

The field experiment was conducted at the BRAC Agricultural Research and Development Centre, Gazipur from June to October, 2012 to investigate the effect of different fertilizer rates on the growth and yield of transplanted *aman* rice genotypes. The experiment was carried out in split-plot design with three replications accommodating the genotypes (G_1= CNI 9012, G_2= GSR IRRI I 2, G_3= BINA dhan7 and G_4= Aloran) in sub plot and different fertilizer rates (F_1= No fertilizer, F_2= Half of recommendation rate, F_3= Two third of recommendation rate and F_4= Recommendation rate) in the main plot. Crop growth duration, plant height, tillers no. hill^{-1}, panicle no. hill^{-1}, panicle length, total grains panicle^{-1}, fertility%, 1000 grain-wt. and grain yield were compared for different treatments. Genotypes showed significant results for all the traits except grain yield but fertilizer and their interaction exhibit insignificant results for most of the characters studied. The maximum mean for producing grain yield was observed in F_2 (5.0 t ha^{-1}) but the minimum in F_1 (4.6 t ha^{-1}). Therefore, application of no fertilizer had negative impact on grain yield. Apparently, the highest value for grain yield (5.2 t ha^{-1}) was found in the combinations of $G_1 \times F_3$, $G_3 \times F_2$ and $G_4 \times F_2$ as well as the lowest (4.2 t ha^{-1}) from $G_1 \times F_1$ combination. Maximum gross return (62500 Tk. ha^{-1}) and gross margin (58255 Tk. ha^{-1}) with F_2 suggested that this fertilizer rate was best for profitable cultivation on tested transplanted *aman* rice genotypes.

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Introduction

Bangladesh is a humid tropical country. This country is an excellent habitat for evolution of rice. It is the staple food for the people of Bangladesh intrinsically associated with their culture, rites and rituals. Rice is grown over 12.25 million hectares (DAE, 2010) in three distinct seasons in Bangladesh. Among the three rice crops, *aman* rice covers about 47.73% of total rice area and contributes to 33.44% of the total rice production (BBS, 2008). World's more than three billion people depend on rice as their staple food (FAO, 2004); among them 69% will take place in Asia (FAO, 2008). Food scarcity has been and will remain as a major concern for Bangladesh. Although the soil and climatic conditions of Bangladesh are favorable for rice cultivation throughout the year, the unit area yield is much below to those of other leading rice growing countries of the world. Therefore, emphasis should be given to increase the yield of rice (especially *aman* rice) through adaptation of proper and intensive fertilizer management practices. Plant nutrients are essential for cultivation of crops. Among the nutrients, nitrogen is the most important and key input for rice production all over the world for its large requirements and instability in soil. It is a fact that rice plants require more nutrients to produce more yields. The efficiency of nitrogen fertilizer especially urea is very low in rice but urea is the principal source of nitrogen for rice in Bangladesh agriculture.

Fertilizer recommendation issue in rice production is drawing attention among researchers and farmers, especially in case of new rice genotypes under climate change situation. Efficient and balanced fertilizer recommendation under environment-friendly condition is crucial to increase rice production worldwide. Appropriate amount of fertilizers applied onto soils reduced greenhouse gas emissions, NO_3 leaching and so on. The yield plateau of rice and adverse environmental impacts due to imbalance use of chemical fertilizers illustrate worldwide attention for efficient nutrient management. Rice, the staple food for most of the people in South and Southeast Asia, removes about 16 to 19 kg of N, 2.5 to 3.5 kg P and 19 to 25 kg K from soil to produce one tone of rough rice (Dobermann *et al.*, 2000).

With the green revolution, the use of chemical fertilizer increases several folds and inefficient use of these fertilizers has resulted in serious environmental consequences. The most adverse environmental impacts in field crops is the depletion of stratospheric ozone due to NO and NO_2 emission. The objective of this paper is to describe efficient ways of using chemical fertilizers for maximal rice production considering the unpredictable climatic condition. Proper soil management practices and especially efficient fertilizer application increase crop yield (Li *et al.*, 2001; Shen, 2002). In sustainable agriculture, nutrient management practices include both crop and soil fertilization. Crop fertilization refers to fertilizer application according to the crop demands, while soil fertilization is targeted to replenish its fertility level. The strategy of efficient fertilizer management program involves precise decision on the right rate, source, time and place of fertilizer application (Bruulsema *et al.*, 2009). The amount of fertilizers to be applied for a target yield may be determined by soil testing, nutrient response or missing element trial techniques. In addition, chemical fertilizers are always expensive inputs for crop production, especially in a developing country like Bangladesh. However, if a farmer is unable to afford the cost of fertilizers required for achieving high yield, he can be advised to reduce the rate of each required fertilizer by 30% so that balanced fertilization is made to achieve a moderate yield, which is assumed to be around 80% of the high yield goal (BARC, 2012). Chemical fertilizers are likely to be even more costly in near future. The actual recommended rates of NPKSZn not only maintain soil health for sustainable agriculture but also save part of the cost of crop production. In addition, global environmental pollution can be reduced by application of reduced rates of fertilizers. Green Super Rice (GSR) project was inaugurated in Bangladesh since 2009 with an aims to produce high and more stable yields with lesser inputs (water, fertilizer, pesticides etc). Keeping these points in mind the present study was undertaken to evaluate the influence of different fertilizer rates on the growth and yield of transplanted *aman* rice genotypes.

Materials and methods

Location and experimental design

The research work was conducted in the BRAC Agricultural Research and Development Centre, Gazipur during June to October 2012 to evaluate the appropriate rate of different fertilizer on yield and yield components of GSR genotypes. The characteristics of soil were: pH 6.62, organic matter (OM) 1.99%, N 0.1%, P 51.03µg/g, K 0.08 meq/100g, S 21.54 µg/g, Zn 0.69 µg/g and B 0.25 µg/g. The soil was sandy loam where the percentage of sand, silt and clay were 61.91, 33.33 and 4.76; respectively (Table 1). The experiment was laid out in split-plot design where fertilizer was in main plot and genotype in sub-plot. The main experimental field was 27.6 m × 27.6 m which was divided into 3 replications. Each replication includes 4 plots & each plot contains 4 sub-plots; in total there were 48 plots. The treatment randomly assigned to each unit plots.

Table 1. Soil properties of the experimental plots.

Texture	pH	OM (%)	N (%)	P (µg/g)	K (meq/100g)	S (µg/g)	Zn (µg/g)	B (µg/g)
Clay loam	6.62	1.99	0.1	51.03	0.08	21.54	0.69	0.25

Plant materials

Four tested genotypes i.e. G_1= CNI 9012, G_2= GSR IRRI I 2, G_3= BINA dhan7 and G_4= Aloran (BRAC hybrid) were used as parameter to conduct this experiment.

Fertilizer treatment

Different rates of fertilizer were F_1= No fertilizer (control), F_2= Half of recommendation (i.e. 90-40-35-30-5 kg ha^{-1} of Urea-TSP-MoP-Gypsum-$ZnSO_4$), F_3= Two third of recommendation (i.e. 120-53.3-46.6-40-6.6 kg ha^{-1} of Urea-TSP-MoP-Gypsum-$ZnSO_4$) and F_4= Recommended rate (i.e. 180-80-70-60-10 kg ha^{-1} of Urea-TSP-MoP-Gypsum-$ZnSO_4$).

The full dose of triple super phosphate (TSP), gypsum, zinc sulphate, one third of urea and half rate of murate of potash (MoP) were applied at the time of final land preparation. The first split of urea was applied at 15 DAT, second was at maximum tillering stage and third installment with rest dose of MoP at panicle initiation stage.

Management of agronomic characters

Pre-germinated seeds of respective varieties were sown in the wet seed bed and proper care was taken to raise the seedlings in seed bed. 28 days old seedlings were transplanted with two seedlings in each hill maintaining the spacing with 20 cm × 15 cm on the well puddle plots.

Intercultural operations were done as and when required. Five hills (excluding border hills) from each plot were selected and tagged after transplanting for taking yield and yield components data at harvest stage. Morphological data were collected for quantitative characters at the appropriate growth stage of rice plant following the description for *Oryza sativa* L. (IRRI, 2002). The characters that were evaluated are plant height (cm), number of tillers m^{-2}, panicles no. m^{-2}, panicle length (cm), filled grains panicle^{-1}; unfilled grains panicle^{-1}, 1000 grain weight (g) and grain yield (ton ha^{-1}) were recorded. An area of 6 m^2 was harvested from centre of each plot and the grains were dried, threshed and adjusted at 14% moisture content to estimate the grain yield.

Statistical analysis

The data were analyzed statistically using Fisher's analysis of variance technique and the mean values were separated using least significant differences (LSD) test at 5% level of significance.

Results and discussion

Results showed that all the studied traits had significant influence due to genotypes except grain yield but most of the yield components i.e. tillers no. hill^{-1}, panicle no. hill^{-1}, panicle length, 1000 grain-wt and grain yield varied non-significantly due to the application of different nutrient rates.

Crop growth duration

Analysis of variance showed that different rates of fertilizer (F), genotypes (G) and their interaction (F × G) had significant effect on crop growth duration (Table 11). The coefficient of variation for this measured trait was 0.87%. Among the tested genotypes, the highest mean performance (113.8 days) for this trait was found in G_3 and the lowest (108.8 and 109.4 days) from G_1 and G_2, respectively (Table 2). So, G_1 and G_2 having shorter growth duration than other tested genotypes. However, in case of fertilizer treatment the highest mean was observed in F_2 (111.5 days), F_3 (111.9 days) and F_4 (112.2 days), respectively but the lowest in F_1 (108.9 days). Therefore, application of no fertilizer may be shorten crop growth duration. The longest duration (115.0 days) was found in the combination of G_3 × F_4 as well as the shortest (105.3 days) from G_2 × F_1 combination.

Table 2. Mean performance of crop growth duration. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	107.0j	105.3k	111.3efgh	112.0defg	108.9B
F_2	108.6i	110.6gh	114.0abc	113.0bcde	111.5A
F_3	109.6hi	111.0fgh	114.6ab	112.6cdef	111.9A
F_4	109.6hi	111.0fgh	115.0a	113.3abcd	112.2A
Mean	108.8*C*	109.4*C*	113.8*A*	112.8*B*	

AB = Variation between fertilizer.

AB = Variation between genotype.

ab = Comparison with genotype and fertilizer.

Plant height

The factor, different rates of fertilizer (F) were significant at 1% level for plant height indicating that application of different rates of fertilizer had significant effect on this character. The factor, genotypes (G) were also significant at 1% level. The interaction between G × F was not significant (Table 11). The coefficient of variation for this character was 2.77%. From the mean value of different rates of fertilizer; it was observed that recommended rate of fertilizer (F_4) gave the tallest (119.8 cm) plant and the shortest (108.4 cm) from

control (F_1). S. K. Dabnath (2012) also reported that recommended fertilizer rate was better in increasing plant height compared to reduced rates and over rates of N, P and K. On the contrary, the tallest plant height (122.1 cm) was found in G_4 and the shortest (111.4 and 110.3 cm) from G_1 and G_3, respectively (Table 3). These results also in agreement with Bisne *et al.* (2006) who stated that plant height significantly differed among different varieties. LSD value shows that in respect of plant height F_2 and F_3 are statistically similar but F_1 are significantly different with F_2 and F_3. Furthermore, LSD value reveals that the difference between G_2 and G_4 was significantly different.

Table 3. Mean performance of plant height. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	106.6	107.3	104.0	116.0	108.4C
F_2	112.3	119.3	110.0	122.6	116.0B
F_3	111.0	117.6	110.6	123.3	115.6B
F_4	115.6	121.0	116.3	126.3	119.8A
Mean	111.4*C*	116.3*B*	110.3*C*	122.1*A*	

AB = Variation between fertilizer.

AB = Variation between genotype.

Tillers no. hill^{-1}

In the result of application of recommended fertilizer (F_4) numerically the highest tillers no. hill^{-1} (10.3) was produced in BINA dhan7 (G_3) and the lowest (6.3) from no fertilizer (F_1) in G_4 (Aloran) (Table 4). The ANOVA table shows that the factor genotypes (G) was significant for tillers no. hill^{-1} at 1% level but the factor of different fertilizer rates (F) and interaction of G × F were not significant (Table 11). M. A. Alim (2012) also found significant effect on tillers no. hill^{-1} due to genotypes. The coefficient of variation for this measured trait was 11.43%. LSD value shows that in respect of tillers no. hill^{-1} G_1 and G_2 were significantly similar but G_3 was highly significant with G_1, G_2 and G_4. The reasons for differences in producing tillers no.

hill^{-1} might be due to the variation in genetic make-up of the variety that might be influenced by heredity. This was consistent with Chowdhury *et al.* (1993).

Table 4. Mean performance of tillers no. hill^{-1}. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	8.0	7.3	8.6	6.3	7.5
F_2	7.6	7.3	9.0	6.6	7.6
F_3	8.0	8.0	9.6	6.6	8.0
F_4	9.0	8.6	10.3	7.0	8.7
Mean	8.1*B*	7.8*B*	9.4*A*	6.6*C*	

AB = Variation between genotype.

Panicle no. hill^{-1}

The mean performance of panicle no. hill^{-1} was almost similar with the results of tillers no. hill^{-1}. The ANOVA table shows that the factor genotypes (G) were significant for panicle no. hill^{-1} at 1% level but the factor of different fertilizer rates (F) and interaction of G × F were not significant (Table 11). The coefficient of variation for this measured trait was 11.37%. Apparently, the highest panicle no. hill^{-1} was gained from the application of recommended fertilizer but this result was not differed with other fertilizer treatments. S. K. Dabnath (2012) reported that fertilization increase the panicle no. hill^{-1} but 25% increase of NPK with RFD (Recommended fertilizer dose) and 25% reduction of NPK from RFD influenced a little compared to RFD. LSD value shows that in respect of panicle no. hill^{-1} G_1 and G_2 were significantly similar but G_3 was highly significant with G_1, G_2 and G_4 (Table 5).

Table 5. Mean performance of panicle no. hill^{-1}. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	7.6	7.0	8.6	6.3	7.3
F_2	7.6	7.0	8.3	6.6	7.3
F_3	8.0	7.3	9.6	6.6	7.8
F_4	8.6	8.3	10.0	6.6	8.3
Mean	8.0*B*	7.4*B*	9.1*A*	6.5*C*	

AB = Variation between genotype.

Panicle length

Among the tested genotypes, G_2 gave the highest panicle length (25.0 cm) and

G_1 gave the lowest (22.3 cm) whereas G_3 and G_4 gave the statistically similar length. In the result of application of two third of recommended dose of fertilizer (F_3) apparently the longest panicle (26.0 cm) was found in GSR IRRI I 2 (G_2) (Table 6). The ANOVA table shows that the tested genotypes (G) were significant for panicle length at 1% level but the factor different fertilizer rates (F) and combination of G × F were not significant (Table 11). The coefficient of variation for this measured trait was 2.64%. LSD value shows that in respect of panicle length G_3 and G_4 was statistically similar but G_2 was highly significant with G_1, G_3 and G_4. Diaz *et al.* (2000) also reported that panicle length varied among varieties. F. A. Banu (2009) showed non-significant results for using different rate of multi nutrient fertilizers.

Table 6. Mean performance of panicle length. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	22.3	23.6	23.3	23.3	23.1
F_2	22.3	25.3	24.0	23.6	23.8
F_3	22.6	26.0	23.3	24.0	23.9
F_4	22.0	25.0	23.6	23.6	23.5
Mean	22.3*C*	25.0*A*	23.5*B*	23.6*B*	

AB = Variation between genotype.

Total grains panicle^{-1}

Analysis of variance showed that different rates of fertilizer (F), genotypes (G) and their interaction (F × G) had significant effect on total grains panicle^{-1} (Table 11). The coefficient of variation for this measured trait was 5.51%. Among the tested genotypes, the highest mean performance (154.3) for this trait was found in G_1 and the lowest (107.9 and 108.0) from G_3 and G_2, respectively. However, in case of fertilizer treatments the highest mean was observed in F_2 (136.9) but the lowest in F_1 (111.6). Therefore, application of no fertilizer had negative impact on total grains panicle^{-1}. This result was in agreement with Mamun *et al.* (2012). The highest value for total grains panicle^{-1} (198.0) was found in the combination of $G_1 \times F_2$ as well as the lowest (96.6) from $G_2 \times F_4$ combination which was statistically not different with the combinations of $G_2 \times F_1$, $G_2 \times F_3$, $G_3 \times F_1$, $G_3 \times F_3$ and $G_4 \times F_1$ (Table 7).

Table 7. Mean performance of total grains panicle^{-1}. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	134.3bcd	106.3ghij	106.0ghij	99.6ij	111.6C
F_2	198.0a	120.6ef	113.3fgh	115.6fg	136.9A
F_3	142.0bc	108.3ghij	102.3hij	127.6cde	120.1B
F_4	142.6b	96.6j	110.0fghi	130.3cde	119.9B
Mean	154.3*A*	108.0*C*	107.9*C*	118.3*B*	

AB = Variation between fertilizer.

AB = Variation between genotype.

ab = Comparison with genotype and fertilizer.

Fertility percentage

The maximum fertility percentage was found in G_1 of F_3 (81.2) and the minimum from G_1 of F_2 (56.1) which was statistically similar with $G_4 \times F_2$ (56.7) as well as statistically not different with the combinations of $G_2 \times F_2$, $G_3 \times F_4$, $G_4 \times F_3$ and $G_4 \times F_4$ (Table 8). The ANOVA table reveals that different rates of fertilizer (F), genotypes (G) and their interaction (F × G) had significant effect on fertility percentage (Table 11). The coefficient of variation for this measured trait was 4.80%. LSD value shows that in respect of fertility percentage F_1 with F_3 and F_2 with F_4 was not significantly different. In case of genotypes, G_1 and G_3 were not significantly different but G_4 was highly significant with G_1, G_2 and G_3.

Table 8. Mean performance of fertility percentage. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	65.8bcdef	63.9defg	70.8bc	66.9bcde	66.8AB
F_2	56.1h	60.8fgh	65.3cdefg	56.7h	59.7C
F_3	81.2a	67.8bcd	71.3b	59.4gh	69.9A
F_4	62.9defg	63.5defg	61.9defgh	61.6efgh	62.5BC
Mean	66.5*AB*	64.0*B*	67.3*A*	61.1*C*	

AB = Variation between fertilizer.

AB = Variation between genotype.

ab = Comparison with genotype and fertilizer.

1000 grain-wt.

Apparently, the highest 1000 grain-wt. (27.3 g) was found in G_4 of F_4 and the lowest was from G_1 of F_3 (15.8 g) and F_2 (15.9 g), respectively (Table 9). The ANOVA table displays that the tested genotypes (G) were significant for this trait at 1% level but the factor different fertilizer rates (F) and their combination of G × F were not significant (Table 11). The coefficient of variation for this measured trait was 4.34%. Islam *et al.* (2011) also reported non-significant effect on 1000 grain-wt. due to different fertilizer rates. LSD value shows that all tested genotypes were statistically highly significant with each other for this trait. The maximum 1000 grain-wt was found in Aloran (26.6 g) and the minimum in CNI 9012 (16.1 g).

Table 9. Mean performance of 1000 grain-wt. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	16.7	26.0	20.2	26.9	22.4
F_2	15.9	25.3	20.2	26.2	21.9
F_3	15.8	24.6	20.3	26.1	21.7
F_4	16.2	26.2	21.5	27.3	22.8
Mean	16.1*D*	25.5*B*	20.5*C*	26.6*A*	

AB = Variation between genotype.

Grain yield

Analysis of variance showed that different rates of fertilizer (F), genotypes (G) and their interaction (F × G) had no significant effect on grain yield (Table 11). Hussain *et al.* (2015) revealed that grain yield was not significantly influenced by the interaction of genotype and fertilizer rate. The coefficient of variation for this measured trait was 8.00%. Numerically, among the tested genotypes, the highest mean performance (5.0 t ha^{-1}) for this trait was found in G_3 and the lowest (4.7 t ha^{-1}) from G_1 and G_2, respectively. However, in case of fertilizer treatments the maximum mean was observed in F_2 (5.0 t ha^{-1}) but the minimum in F_1 (4.6 t ha^{-1}). Therefore, application of no fertilizer had negative impact on grain yield. Apparently, the highest value for grain yield (5.2 t ha^{-1})

was found in the combinations of $G_1 \times F_3$, $G_3 \times F_2$ and $G_4 \times F_2$ as well as the lowest (4.2 t ha^{-1}) from $G_1 \times F_1$ combination (Table 10).

Table 10. Mean performance of grain yield. The mean performance was tested by LSD.

Fertilizer	Genotype				Mean
	G_1	G_2	G_3	G_4	
F_1	4.2	4.5	5.0	4.8	4.6
F_2	4.7	4.9	5.2	5.2	5.0
F_3	5.2	4.7	4.9	4.9	4.9
F_4	5.1	4.8	4.7	5.0	4.9
Mean	4.7	4.7	5.0	4.9	

Economic analysis

Farmers in Bangladesh are faced with many socio-economic problems regarding crop production, so the economic aspect of different fertilizer management packages for transplanted *aman* rice production needs to be considered. However, the seed of GSR and other check varieties were found free of cost for this trial. So, in this regard only different rates of fertilizer individually involved various variable costs. Table 12 showed that variable cost increased with the increasing of fertilizer rates. The highest gross return was calculated from F_2 (62500 Tk. ha^{-1}) followed by F_3 and F_4 (61250 Tk. ha^{-1}) with the lowest in F_1 (57500 Tk. ha^{-1}). The gross margin was also the highest in F_2 (58255 Tk. ha^{-1}) but the lowest in F_4 (52760 Tk. ha^{-1}). The highest gross return and gross margin was exhibited from F_2 and it was because of maximum grain yield gained from this treatment.

Table 11. Analysis of variance of all the characters with level of significance.

Item	F Value								
	CGD	PH	TN	PN	PL	TGP	FER%	TGW	YLD
Replication	0.59n	0.84n	1.78n	1.65n	0.74n	4.56n	0.31n	0.24n	0.35n
Fertilizer (F)	38.23s	19.57s	3.84n	3.57n	2.95n	23.78s	12.6s	2.01n	1.33n
Genotype (G)	75.3s	34.39s	18.27s	18.02s	36.63s	127.77s	9.68s	299.2s	1.22n
F × G	3.12s	0.64n	0.27n	0.46n	1.77n	16.08s	8.05s	0.43n	1.38n

n = Non significant, where $p>0.05$ and

s = Significant, where $p<0.05$.

Table 12. Treatment wise variable cost (fertilizer), gross return and gross margin.

Treatments	Variable cost (Tk. ha^{-1})	Gross return (Tk. ha^{-1})	Gross margin (Tk. ha^{-1})
F_1	0.00	57500	57500
F_2	4245	62500	58255
F_3	5647	61250	55603
F_4	8490	61250	52760

Urea = 19 Tk. kg^{-1}, TSP = 23 Tk. kg^{-1}, MoP = 15 Tk. kg^{-1}, Gypsum = 08 Tk. kg^{-1}, $ZnSO_4$ = 170 Tk. kg^{-1}, Paddy = 12.50 Tk. kg^{-1}.

Conclusion

From the present study, it is clear that CNI 9012 and GSR IRRI I 2 was earlier than other tested genotypes and applying half of recommendation fertilizer rate produced maximum grain yield as well as achieved highest gross return and gross margin compared with control, two-third of recommendation and recommended fertilizer rates. So, it might be concluded that the application of half of recommendation fertilizer rate is enough to optimize yield as well as economically profitable for the cultivation of rice genotypes; CNI 9012, GSR IRRI I 2, BINA dhan7 and Aloran in transplanted *aman* season. However, further investigation is necessary to draw a definite conclusion.

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