



## EFFECT OF NITROGEN LEVELS ON THE YIELD AND OTHER AGRONOMIC CHARACTERS OF LOCAL TRANSPLANTED AMAN RICE IN KHULNA

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**Abstract:** An investigation was carried out during *aman* season, 2005 at the Field Laboratory of Agrotechnology Discipline, Khulna University, Khulna. Local *aman* rice variety *Jatai* was tested against 4 different levels of nitrogen viz. 0, 20, 40 and 60 kg N ha<sup>-1</sup>. The experimental results revealed that nitrogen levels significantly affected plant height (cm), number of tillers hill<sup>-1</sup>, weight of 1000-grain (g), grain yield (t ha<sup>-1</sup>), biological yield (t ha<sup>-1</sup>) and harvest index (%). Higher N dose (60 kg ha<sup>-1</sup>) produced higher plant height (127.57 cm) and panicle length (20.43 cm). The highest number of tillers hill<sup>-1</sup> (13), effective tillers hill<sup>-1</sup> (11.70), filled grains panicle<sup>-1</sup> (61.25), weight of 1000-grain (30.25 g), grain yield (4.17 t ha<sup>-1</sup>), biological yield (12.46 t ha<sup>-1</sup>) and harvest index (33.48 %) were produced with 40 kg N ha<sup>-1</sup>. The lowest grain yield and yield contributing characters were produced by control treatment (0 kg N ha<sup>-1</sup>).

**Keywords:** Rice, local variety, nitrogen

### Introduction

Rice is the staple food in Asia and many other countries of the world. In Bangladesh it occupies 74 % of total cropped area and the average yield is around 1.96 t ha<sup>-1</sup>, which is very low compared to potential rice growing countries (BBS, 2005).

Bangladesh has a large number of cultivars and land races of rice. With the introduction of high yielding varieties (HYV) the number of indigenous varieties has been reduced drastically; but still the area occupied by those varieties exceeds 50% of the total land under rice cultivation. (BBS, 2005) Local *aman* rice is the only source of cash income for many farmers of coastal region of Khulna as most of them produce only *aman* rice because *boro* rice cultivation is very much difficult in dry season due to high salinity level in the soil and lack of irrigation water. So, local *aman* rice is the important crop of coastal area of Khulna district of Bangladesh.

Many local *aman* rice varieties like *Jatai*, *Bashful*, *Balam*, *Ranisalute*, *Katchra* etc are cultivated in Khulna region under rainfed condition. Among these varieties *Jatai* is the most popular in this region because of higher yield in comparison with other local cultivars.

Fertilizer is now one of the expensive inputs for crop production in Bangladesh. Among the nutrients, nitrogen stands prominent in rice cultivation because rice plant requires huge amount of nitrogen throughout its life cycle for proper growth and development (Prasertsak and Fukai, 1997). Nitrogen highly influences the yield and other yield components. Nitrogen fertilizer also

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prolongs grain filling duration that favors accumulation of more photosynthate in the grain and hence, increases grain weight (Sadeque, 1985). Rashid *et al.* (1996) reported that nitrogen is deficient in almost all the soils of Bangladesh.

Therefore, the importance of N fertilizer in increasing rice yield is widely recognized. At present, the farmers of Bangladesh use increased amount of nitrogen fertilizer to get higher yield, but it is also evident that the yield of rice is affected very much if correct dose is not applied (Ahsan, 1996). So, optimum level of N supply is required to get satisfactory yield.

The objectives of this study are to identify the effect of different levels of nitrogen on the performance of local transplanted *aman* rice variety Jatai and to determine the optimum nitrogen level for the variety Jatai for obtaining maximum yield.

### Materials and Methods

The experiment was conducted in *aman* season during June – December, 2005 at the Field Laboratory of Agrotechnology Discipline, Khulna University, Khulna, situated in the Agro-ecological Zone (AEZ) Ganges Tidal Flood plains.

A local *aman* rice variety ‘Jatai’ which is extensively cultivated in the coastal belt of Khulna district was selected for this study. Four levels of nitrogen viz. 0(control), 20, 40 and 60 kg N ha<sup>-1</sup> were selected as experimental treatments.

The experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications. There were 16 plots and the plot size was 4m×4m.

Forty-five days old seedlings were transplanted with three seedlings hill<sup>-1</sup> maintaining 20 cm×20 cm spacing in the main field.

Full dose of TSP, MP and ZnSO<sub>4</sub> were applied at the rate of 100, 35 and 5 kg ha<sup>-1</sup> respectively to the field during final land preparation. Urea as a source of nitrogen was applied in four splits: First dose at final land preparation and rest three were top dressed at 10, 25 and 50 days after transplanting. Agronomic management practices were done as and when necessary.

Yield parameters were recorded from five randomly selected hills in each plot. Grain and straw yields were recorded from the whole plot basis. Data were recorded on plant height (cm), number of effective tillers hill<sup>-1</sup>, panicle length at maturity (cm), number of filled grains panicle<sup>-1</sup>, weight of 1000-grains (g), grain yield (t ha<sup>-1</sup>), biological yield (t ha<sup>-1</sup>) and harvest index (%).

In case of plant height data were collected five times at 20, 35, 50, 65 days after transplanting (DAT) and at harvesting. Other data were collected after harvesting. Average values were calculated and were analyzed for ANOVA. Mean values were compared by DMRT.

### Results

**Plant height:** Plant height was influenced significantly with various levels of nitrogen fertilizer at 1% level (Fig.1). It was observed that treatment with higher nitrogen fertilizer levels produced higher vegetative growth. The highest plant height (127.57 cm) was produced by 60 kg N ha<sup>-1</sup>, whereas the lowest height (116.27 cm) was produced when no nitrogen was applied. The result of the present experiment indicated that the plant height of the local variety Jatai increased with increasing nitrogen fertilizer levels.

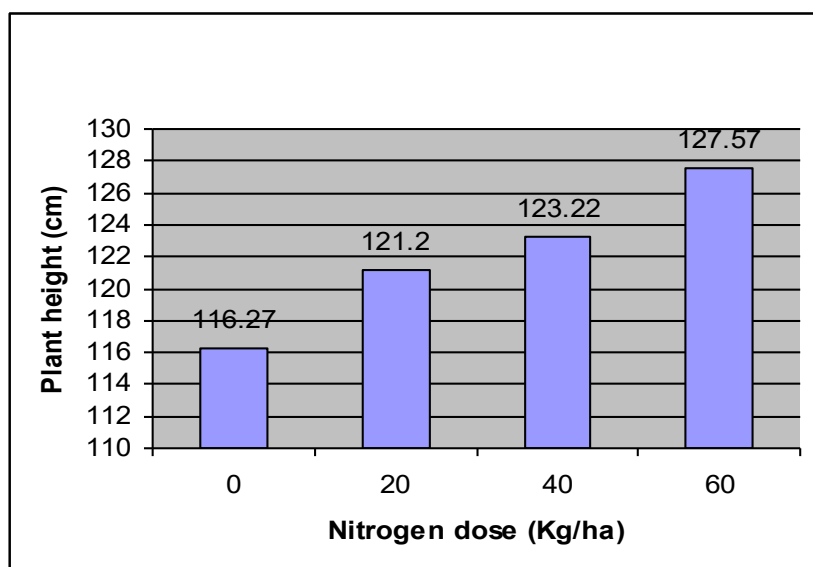


Fig 1. Effect of nitrogen on plant height of local transplanted *aman* rice, var. Jatai.

**Number of tillers hill<sup>-1</sup>:** The effect of nitrogen fertilizer on number of tillers hill<sup>-1</sup> was found significant. The highest number of tillers hill<sup>-1</sup> (13) was produced by 40 kg N ha<sup>-1</sup> which was statistically similar with 20 kg N ha<sup>-1</sup> and 60 kg N ha<sup>-1</sup> (Table1). The lowest number of tillers hill<sup>-1</sup> (11.5) was obtained when no nitrogen was applied. The results indicated that level of N was not very critical to produce number of tillers hill<sup>-1</sup> because there were no differences in tiller production between 20 and 60 kg N ha<sup>-1</sup>.

**Number of effective tillers hill<sup>-1</sup>:** Levels of nitrogen affected number of effective tillers hill<sup>-1</sup> significantly at 1% level. Among the nitrogen doses the highest number of effective tillers hill<sup>-1</sup> (11.70) was produced from 40 kg N ha<sup>-1</sup> which was statistically similar with 20 kg N ha<sup>-1</sup> and 60 kg N ha<sup>-1</sup> (Table 1). Treatment without nitrogen showed lowest number of tillers hill<sup>-1</sup> (10.25). The result of the present experiment suggested that similar trend existed in the production of total tiller and effective tillers hill<sup>-1</sup> due to N fertilizer.

**Panicle length:** Panicle length was also affected significantly by nitrogen doses. The longest length of the panicle (20.43cm) was produced by 60 kg N ha<sup>-1</sup> which was statistically similar with 40 kg N ha<sup>-1</sup> and the shortest panicle length (16.79cm) was obtained where no nitrogen was applied (Table 1).

**Number of filled grains panicle<sup>-1</sup> :** The number of filled grains panicle<sup>-1</sup> was significantly influenced at 1% level due to different nitrogen fertilizer doses. Filled grains panicle<sup>-1</sup> ranged from 61.25 to 55.75 (Table 1). The highest number of filled grains panicle<sup>-1</sup> (61.25) was obtained from 40 kg N ha<sup>-1</sup> which was statistically similar with 60 kg N ha<sup>-1</sup> and the lowest number of filled grains panicle<sup>-1</sup> (55.75) was obtained from control treatment.

**Weight of 1000 grain:** Thousand grain weights were different due to different N-doses. The highest weight (30.25g) was found when 40 kg N ha<sup>-1</sup> was applied which was statistically similar with 60 kg N ha<sup>-1</sup> (Table 1). The lowest weight (27.85g) was found when no nitrogen was applied.

**Grain yield:** There was significant variation among the nitrogen doses in respect of grain yield. The highest grain yield (4.17 t ha<sup>-1</sup>) was obtained when 40 kg N ha<sup>-1</sup> was applied which was statistically similar with 60 kg N ha<sup>-1</sup>(Table 1). Grain yield was the lowest (3.04 t ha<sup>-1</sup>) when no nitrogen was applied.

**Biological yield:** Nitrogen doses showed significant effect on the biological yield of rice. The highest biological yield (12.46 t ha<sup>-1</sup>) was produced by 40 kg N ha<sup>-1</sup> which was statistically similar with 60 kg N ha<sup>-1</sup> (Table 1). The lowest biological yield (10.22 t ha<sup>-1</sup>) was obtained from no N applications.

**Harvest index:** The effect of nitrogen level on harvest index was significant. The highest harvest index (33.48 %) was obtained from 40 kg N ha<sup>-1</sup> which was statistically similar with 20 kg N ha<sup>-1</sup> and 60 kg N ha<sup>-1</sup>(Table 1). The lowest harvest index (29.79 %) was recorded from the control treatment.

Table 1. Effect of nitrogen level on yield and yield contributing characters of local transplanted aman rice, var. *Jatai*.

N levels (kg ha <sup>-1</sup> )	Number of Tillers hill <sup>-1</sup>	Effective tillers hill <sup>-1</sup>	Panicle length (cm)	Filled grains panicle <sup>-1</sup>	Weight of 1000 grain (g)	Grain yield (t ha <sup>-1</sup> )	Biological yield (t ha <sup>-1</sup> )	Harvest index (%)
00	11.5 b	10.25 b	16.79 b	55.75 c	27.85 b	3.04 c	10.22 c	29.79 b
20	12.5 a	11.23 a	17.46 b	58 b	28.50 b	3.57 b	11.00 b	32.48 a
40	13 a	11.70 a	19.48 a	61.25 a	30.25 a	4.17 a	12.46a	33.48 a
60	12.45 a	11.25 a	20.43 a	60.75 a	29.50 a	4.04 a	12.12 a	33.35 a
Level of significance	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05

Figures bearing letter(s) in common do not differ significantly by DMRT

### Discussion

It was observed in the present investigation that treatments with higher nitrogen levels produced higher vegetative growth. The results indicated that plant height increased with increasing nitrogen levels. Almost similar result was also found by Ahmed *et al.* (2005), who reported that plant height increased with increasing rates of nitrogen. The number of tillers hill<sup>-1</sup> and effective tillers hill<sup>-1</sup> also increased with application of nitrogen in different levels. This finding is in agreement with Salam (1989) and Kamdasamy and Palaniappan (1990), who reported that tillering is positively correlated with nitrogen content of the plant.

From the result it was found that panicle length was increased up to a certain level (60 kg N ha<sup>-1</sup>) of N fertilizer application. Manzoor *et al.* (2006) reported that panicle length increased with

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increasing nitrogen rates. Number of filled grains panicle<sup>-1</sup> increased with increasing N-dose up to 40 kg ha<sup>-1</sup>. Almost similar results were obtained by Ghobrial (1993). He observed that grains panicle<sup>-1</sup> and grain yield increased with increasing nitrogen fertilizer rates. Thousand-grain weight increased with increasing nitrogen levels up to 40Kg N ha<sup>-1</sup>. Awan *et al.* (1984) also found that 1000-grain weight increased by the application of higher dose of nitrogen fertilizer. It was found that grain yield was increased with increasing nitrogen levels up to 40 kg N ha<sup>-1</sup> and decreased above this dose. The result of the present experiment was in agreement with the finding of Singh and Pillai (1991); they reported that grain yield increased with increasing nitrogen doses up to a certain level and then decreased. Biological yield and harvest index were also found superior with higher doses of nitrogen. Ahmed *et al.* (2005) observed that high N rates tended to increase biological yield as well as harvest index.

### Conclusion

Nitrogen doses influenced yield and yield contributing characters of rice variety Jatai and among the nitrogen levels studied; 40 kg N ha<sup>-1</sup> had been proved as the best dose for higher yield. Further investigation is suggested with other doses to optimize the correct level of nitrogen for obtaining maximum yield the variety *Jatai*.

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