J. Agrofor. Environ. 3 (2): 47-48, 2010 ISSN 1995-6983

Effect of mixed fertilizer on the yield and yield attributes of rice

M.F. Hossain, M.A. Hasan and M.O. Faruq
Department of Agronomy, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh

Abstract: The experiment was conducted at the Hajee Mohammad Danesh Science and Technology University Farm, Dinajpur, Bangladesh during *aman* (season July to December) of 2008 to observe the influence of mixed fertilizer with urea on the yield and yield contributing characteristics of rice. The experiment was laid out in a randomized complete block design with three replications. '*Maharaja'* used as a commercial mixed fertilizer that content N-8%, P-20%, K-14% and S-5%. The fertilizer treatments were arranged considering the requirement of rice according to the soil status and nutrient content of the mixed fertilizer. The experiment consisted of fourteen treatments. All the treatments produced significantly higher grain yield than control. Growth attributes of rice such as fertile tillers hill^{-1} and grains panicle^{-1} showed higher value with mixed fertilizer @ 225 kg ha^{-1} + urea @ 100 kg ha^{-1}. The highest grain yield was obtained from mixed fertilizer @ 225 kg ha^{-1} with urea @ 100 kg ha^{-1} that was statistically similar to mixed fertilizer @ 225 kg ha^{-1} + urea @ 140 kg ha^{-1}, mixed fertilizer @ 225 kg ha^{-1} + urea @ 180 kg ha^{-1} and mixed fertilizer @ 250 kg ha^{-1} + urea @ 100 kg ha^{-1}.
Key words: Mixed fertilizer, yield, rice

Introduction

Higher yield in agriculture is likely to continue depending on rational and effective application of chemical fertilizers (Plucknett and Smith, 1986). The use of chemical fertilizers has been fairly spread up in most of the rice growing countries of the world so as to obtain a bumper production. The organic fertilizer is traditionally an important source for supplying nutrients for rice in Bangladesh but use of inorganic fertilizers has increased dramatically, whereas utilization of organic fertilizers decreased. Some mixed fertilizers now available in the market but the yield performance of crop by using mixed fertilizer is not clear. Mixed fertilizer content more than one elements. Any kind of mixed fertilizer is not sufficient to supply required nutrients for all crops. Use of judicious combination of mixed fertilizer with other chemical fertilizer especially urea is important. This will ultimately economize fertilizer use and maintain soil productivity and yield. The information is limited on response of rice to commercial mixed fertilizer with combination of urea particularly in respect of nutrient content. Therefore, the present investigation was aimed to study the effect of mixed fertilizer on the yield and yield attributes of rice.

Materials and Methods

The experiment was conducted at the Hajee Mohammad Danesh Science and Technology University Farm, Dinajpur, Bangladesh during *aman* season (July to December) of 2008. The experimental site was a medium high land with sandy loam soil having a pH value of 6.0. The experiment was laid out in a randomized complete block design with three replications. 'Maharaja' used as a commercial mixed fertilizer that content N-8%, P-20%, K-14% and S-5% as per declaration of the producing company. The fertilizer treatments were arranged considering the requirement of rice according to the soil status and nutrient content of the mixed fertilizer. BR11 was used as a test crop in the experiment. The experiment consisted of fourteen treatments viz.,i) control (no fertilizers)-T_1, ii) Recommended fertilizer of NPKSZn-T_2, iii) Mixed fertilizer @ 200 kg ha^{-1} + Urea@ 0 kg ha^{-1} -T_3, iv) Mixed fertilizer@ 200 kg ha^{-1} + Urea@ 100 kg ha^{-1}-T_4, v) Mixed fertilizer @ 200 kg ha^{-1} + Urea@ 140 kg ha^{-1} -T_5, vi) Mixed fertilizer @ 200 kg ha^{-1} + Urea @ 180 kg ha^{-1} -T_6, vii) Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 0 kg ha^{-1} -T_7, viii) Mixed fertilizer@ 225 kg ha^{-1} + Urea @ 100 kg ha^{-1} -T_8, ix) Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 140 kg ha^{-1}-T_9, x) Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 180 kg ha^{-1} -T_{10}, xi) Mixed fertilizer @ 250 kg ha^{-1}+ Urea @ 0 kg ha^{-1}-T_{11}, xii) Mixed fertilizer @ 250 kg ha^{-1} + Urea @ 100 kg ha^{-1} -T_{12}, xiii) Mixed fertilizer @ 250 kg ha^{-1} + Urea @140 kg ha^{-1}-T_{13} and xiv) Mixed fertilizer @ 250 kg ha^{-1} + Urea @ 180 kg ha^{-1}-T_{14}. The unit plot size was 4.0m × 2.5m. According to the experimental specification, no fertilizer was used under control treatment. Mixed fertilizer as per treatment and P, K, S and Zn were applied as basal through TSP 65 kg, MP 110 kg, gypsum 87 kg and $ZnSO_4$ 2.25 kg ha^{-1} were applied at final land preparation. Nitrogen was applied in the form of urea @ 138 kg ha^{-1} in two equal splits at 20 and 45 days after transplanting. Thirty-day-old seedlings were transplanted in the plots at a spacing of 20 cm × 15 cm using 3 seedlings hill^{-1} on 15 July 2008. All other cultural practices were done uniformly as per recommendation. Whole plots were harvested to obtain grain yield. Data were analyzed following the ANOVA technique and mean differences were adjudged with Duncan's Multiple Range Test (DMRT).

Results and Discussion

Plant height was significantly influenced by fertilizer treatment. The tallest plant (94.55 cm) was found with mixed fertilizer @ 250 kg ha^{-1} + Urea @ 180 kg ha^{-1} (T_{14}). The lowest plant height (86.93cm) was observed in control treatment (T_1). Similar observation was made by Hossain *et al*. (1997). The tallest plant might be due to sufficient supply of nutrients. The highest number of total tillers hill^{-1} (9.53) was observed with Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 100 kg ha^{-1}(T_8), Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 140 kg ha^{-1} (T_9) that was statistically similar to Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 180 kg ha^{-1} (T_{10}) and Recommended fertilizer of NPKSZn (T_2). The lowest number of total tillers hill^{-1} (6.65) observed under control treatment (T_1)(Table1). The highest total tillers hill^{-1} (9.53) and the highest fertile tillers hill^{-1} (8.23) were observed with Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 100 kg ha^{-1} (T_8) that was statistically similar to Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 140 kg ha^{-1} (T_9) and Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 180 kg ha^{-1} (T_{10}). The lowest number of fertile tillers hill^{-1} (6.20) was found with Mixed fertilizer @ 200 kg ha^{-1} + Urea @ 0 kg ha^{-1}(T_3) that was similar to control (T_1) (Table 1). Number of

spikelets panicle^{-1} was significantly influenced due to fertilizer treatment. The highest number of spikelets panicle^{-1} (96.15) was observed with Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 180 kg ha^{-1} (T_{10}) that was similar to Mixed fertilizer @ 200 kg ha^{-1}+ Urea @ 180 kg ha^{-1} (T_6), Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 100 kg ha^{-1} (T_8), Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 140 kg ha^{-1} (T_9) and Mixed fertilizer @ 250 kg ha^{-1} + Urea @180 kg ha^{-1}(T_{14}). The highest grains panicle^{-1} (80.57) was recorded with mixed fertilizer @ 250 kg ha^{-1} + Urea @ 100 kg ha^{-1} (T_{12}) that was similar to Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 100 kg ha^{-1} (T_8). Lowest number of grains panicle^{-1} (69.15) was found in control treatment (T_1) (Table 1). Highest 1000 grain weight (27.98g) was obtained from mixed fertilizer (225 kg ha^{-1}) + Urea @ 0 kg ha^{-1}(T_7). Researchers opined that the 1000 grain weight is usually a stable varietal character and the environmental factors as well as management practices has less effect on the variation of 1000 grain weight (Yoshida, 1981; Mannan, 2005; Shivay and Singh, 2003). Grain yield was significantly affected due to fertilizer treatments. The highest grain yield (3.46 t ha^{-1}) was recorded with Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 100 kg ha^{-1} (T_8) that was statistically similar to mixed fertilizer @ 225 kg ha^{-1}+ Urea @ 140 kg ha^{-1} (T_9), Mixed fertilizer @ 225 kg ha^{-1} + Urea @ 180 kg ha^{-1} (T_{10}), Mixed fertilizer @ 250 kg ha^{-1} + Urea @ 100 kg ha^{-1} (T_{12}) and Mixed fertilizer @ 250 kg ha^{-1} + Urea @ 140 kg ha^{-1}(T_{13}). The application of mixed fertilizer with combination urea showed a positive effect on the yield components of rice. These treatments significantly increased fertile tillers hill^{-1} and grains panicle^{-1}, which might have the contribution to highest grain yield. Reduction of grain yield in control might be attributed due to significant reduction in fertile tillers hill^{-1}. The highest straw yield (4.95 t ha $^{-1}$) was obtained with Mixed fertilizer @ 225 kg ha^{-1} + Urea@ 180 kg ha^{-1} (T_{10}). The lowest straw yield (2.85 t ha^{-1}) was found without fertilizer (T_1) (Table 1). Mannan (2005) reported that the straw yield of rice increased significantly due to the application of nitrogen over control. The vigorous crop growth in nitrogen treated plots might have resulted higher straw yields. It was concluded that to get higher grain yield through mixed fertilizer used *Maharaja* @ 225-250 kg ha^{-1} with Urea @ 100 -140 kg ha^{-1} in *aman* season.

Table 1. Effect of commercial mixed fertilizer (*Maharaja*) on the yield and yield attributes of rice (cv. BR 11)

Treatment	Yield and yield components								
	Plant height (cm)	Total tillers hill^{-1}	Fertile tillers hill^{-1}	Panicle length (cm)	Spikelets panicle^{-1}	Grains panicle^{-1}	1000 grain wt. (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})
T_1	86.93d	6.6f	6.23e	19.42e	85.6e	69.15e	27.60d	2.02g	2.85f
T_2	90.28b-d	9.38a	7.78b	20.55ab	90.98cd	76.38b	27.61cd	3.05d	4.08d
T_3	88.8cd	7.4e	6.2e	19.85c-e	81.95f	60.72f	27.81b	2.20f	3.53e
T_4	89.45b-d	7.95cd	7.1cd	20.42ab	85.23e	73.80bc	27.61cd	3.19cd	4.3cd
T_5	92.07a-c	8.10c	7.05cd	20.10b-d	90.45d	72.15cd	27.60d	3.23bc	4.65a-c
T_6	92.08a-c	8.58b	7.93ab	20.35ab	94.15ab	70.97d	27.70b-d	3.19cd	4.90ab
T_7	88.47cd	8.78b	6.8d	19.77de	85.43e	70.55de	27.98a	2.50e	3.45e
T_8	89.53b-d	9.53a	8.23a	20.58ab	93.60a-c	80.47a	26.67e	3.46a	4.53bc
T_9	89.8b-d	9.53a	8.03ab	20.3a-c	94.43ab	79.20c	26.60e	3.45a	4.70a-c
T_{10}	91.72a-c	9.28a	8.20a	20.35ab	96.15a	74.18bc	27.66b-d	3.31a-c	4.95a
T_{11}	88.48c-d	7.48de	7.10cd	20.65a	86.3e	75.5b	27.75	2.49e	3.68e
T_{12}	89.18b-d	7.78c-e	7.33cd	20.25a-c	90.23d	80.57a	27.77bc	3.44a	4.5bc
T_{13}	92.6ab	7.8c-e	7.18cd	20.27a-c	91.85b-d	74.93bc	27.80b	3.36ab	4.70a-c
T_{14}	94.55a	8.02c	7.23c	20.33a-c	93.68a-c	73.93bc	27.70b-d	3.29bc	4.80ab
CV (%)	2.48	3.88	3.24	1.48	2.10	2.47	0.38	3.07	5.83
Level of sig.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

*Figures in a column followed by different letters differ significantly but with common letter (s) do not differ significantly at 5% level of probability
T_1= Control (without fertilizers), T_2= Recommended fertilizer (NPKSZn), T_3= Mixed fertilizer=200 kg/ha + Urea=0 kg/ha, T_4= Mixed fertilizer=200 kg/ha + Urea=100 kg/ha, T_5= Mixed fertilizer=200 kg/ha + Urea=140 kg/ha, T_6= Mixed fertilizer=200 kg/ha + Urea=180 kg/ha, T_7= Mixed fertilizer=225 kg/ha + Urea=0 kg/ha, T_8= Mixed fertilizer=225 kg/ha + Urea=100 kg/ha, T_9= Mixed fertilizer=225 kg/ha + Urea=140 kg/ha, T_{10}= Mixed fertilizer=225 kg/ha + Urea=180 kg/ha, T_{11}= Mixed fertilizer=250 kg/ha + Urea=0 kg/ha, T_{12}= Mixed fertilizer=250 kg/ha + Urea=100 kg/ha, T_{13}= Mixed fertilizer=250 kg/ha + Urea=140 kg/ha, T_{14}= Mixed fertilizer=250 kg/ha + Urea=180 kg/ha

References

Hossain, M.B, Islam, M.R., Rahman, M.M. and Jahiruddin, M. 1997. Effect of integrated nutrient management on yield and yield components of BR11. Progress. Agric.8 (1 &2): 83-86.

Mannan, M.A. 2005. Effects of planting date, nitrogen fertilization and water stress on the growth, yield and quality of fine rice. A Ph.D Dissertation. Dept. Agron. Bangladesh Agril. Univ., Mymensingh.

Plucknett D.L. and Smith N.J.H. 1986. Sustaining Agricultural Yields. Bio. Sci. 36(1):40- 45.

Shivay, Y.S. and Singh, S. 2003. Effect of planting geometry and nitrogen level on growth, yield and nitrogen use efficiency of scented hybrid rice (*Oryza sativa*). Indian J. Agron. 48(1): 42-44.

Yoshida, S. 1981. Fundamentals of Rice Crop Science. Intl. Rice Res. Inst. Los Banos, Philippines. pp. 241-248.