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OPTIMIZING FERTILIZER RATE FOR BANGLAMATI (BRRI dhan50) RICE IN EASTERN SURMA-KUSHIYARA FLOODPLAIN

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ABSTRACT

Hoque M, Rahman MZ, Hasan AK, Haque MM (2016) Optimizing fertilizer rate for Banglamati (BRRI dhan50) rice in Eastern Surma-Kushiyara Floodplain. *Int. J. Sustain. Crop Prod.* 11(2), 1-3.

An experiment was conducted at Satra village of Sadar Upazilla, Sylhet during November 2011 to May 2012 to investigate the effect of rate of fertilizers on the growth and yield of rice var. BRRI dhan50. The experiment consisted of nine treatments which were control (T_1), 65-40-25-4.5-0.5 (T_2), 97.5-60-35.5-6.75-0.75 (T_3), 130-80-50-9-1 (T_4), 162.5-100-62.5-11.25-1.25 (T_5), 195-120-75-13.5-1.5 (T_6), 227.5-140-87.5-15.75-1.75 (T_7) as N-P-K-S-Zn kg ha^{-1}, respectively, cow dung 20 t ha^{-1} (T_8) and 75 kg N+10 kg P+20 kg K (T_9). The experiment was laid out in a randomized complete block design with three replications. The results showed significant variations among the fertilizer doses for all the measured crop characters like plant height, number of panicles hill^{-1}, length of panicle, number of spikelet panicle^{-1}, percent unfilled grain, 1000-grain weight, grain yield, straw yield and harvest index. The highest grain yield (5.23 t ha^{-1}) was recorded in treatment T_4 (N-P-K-S-Zn: 130-80-50-9-1 kg ha^{-1}). The treatment T_3 and T_8 produced 4.95 t ha^{-1} and 4.83 t ha^{-1} grain yields, respectively; and these are statistically similar to the treatment T_4. On the other hand the lowest grain yield (3.07 t ha^{-1}) was recorded in treatment T_7. In fine application of fertilizer at the rate of N-P-K-S-Zn: 97.5-60-35.5-6.75-0.75 kg ha^{-1} would be recommended for maximum production of BRRI dhan50 rice in Sylhet region of Bangladesh.

***Key words**: fertilizer, BRRI dhan50, growth and yield*

INTRODUCTION

Aromatic rice is known for its characteristic fragrance which constitutes a small but special group of rice. Aromatic rice is a bit more expensive than plain white rice, but their qualities are well worth the price. Aromatic varieties fetch higher price in rice market than the non-aromatic ones. Cultivation of fine as well as aromatic rice has been gaining popularity in Bangladesh over the recent years, because of its huge demand both for internal consumption and export (Das and Baqui, 2000). Aromatic Basmati rice has gained a wider acceptance in the Middle East and in Europe (Yoshihashi 2005). BRRI dhan50 is as like as Basmati rice in terms of their traits and quality which is popularly known as Banglamati rice. Aromatic rice varieties have occupied about 12% of the total transplant *aman* rice cultivation (BBS 2008). Only some of these are unique for quality traits including fineness, aroma, taste and protein contents (Kaul *et al*. 1982). Medium low-land is suitable for growing aromatic rice and its production can be increased significantly through using available high yielding varieties and ensuring efficient management of nutrient, water, pest and diseases and other necessary cultural practices. Experts urged for creating more facilities for exports of aromatic fine rice by boosting native production and put more importance on minimum use of insecticides and introduction of integrated pest managements and maximum use of composts, improved technologies etc. The climatic and edaphic condition of Sylhet region is in favour of aromatic rice cultivation. Sylhet is one of the centre of origin of aromatic rice and different personnel and innovative farmers already have been collected a good number of local varieties of aromatic rice. There is huge potential for enhancing aromatic rice production in Sylhet region by utilizing the latest agro-technologies and existing natural resources and this rice could be exported after meeting local demand in near future.

Recommendation on fertilizer requirement for growing coarse rice in Sylhet region is available, but in case of aromatic and fine rice such information is lacking. It was observed that, BRRI dhan50 is a potential variety for Sylhet region which can produced up to 4.43 t ha^{-1} of grain yield in this region (Hoque *et al*. 2012). Therefore, the present study was undertaken to find out the optimum level of fertilizers for BRRI dhan50 rice cultivation in the Eastern Surma-Kushiyara Floodplain of Bangladesh.

MATERIALS AND METHODS

The experiment was carried out at Satra village of Sylhet Sadar Upzilla, Sylhet during November 2011 to May 2012 to study the effect of different fertilizers levels on the growth and yield of BRRI dhan50. The experimental site belongs to the Eastern Surma-Kushiyara Floodplain (AEZ 20). At the onset of experimentation, a composite soil sample was collected at 0-15 cm depth from the experimental plots and was analyzed. The soil was silty loam with low organic matter (1.37%) and acidic in nature (pH 5.1). The N (0.1%) and S (22 ppm) content is low and P (2.0 ppm) content is very low. The K (0.18 me/100 g), Zn (98 ppm) and B (0.42 ppm) content is medium.

The experiment consisted of nine treatments which were control (T_1), 65-40-25-4.5-0.5 (T_2), 97.5-60-35.5-6.75-0.75 (T_3), 130-80-50-9-1 (T_4), 162.5-100-62.5-11.25-1.25 (T_5), 195-120-75-13.5-1.5 (T_6), 227.5-140-87.5-15.75-1.75 (T_7) as N-P-K-S-Zn kg ha^{-1}, cow dung 20 t ha^{-1} (T_8), and 75 kg N + 10 kg P + 20 kg K (T_9). The

experiment was laid out in randomized complete block design with three replications. The unit plot size was 4.0 m × 2.5 m.

The nursery bed was fertilized with FYM at the rate of 3 kg sqm^{-1} before final bed preparation and sprouted rice seeds were sown in the wet seed bed. The experimental plots were fertilized with different fertilizer doses combinations as per treatment. The full amount of phosphorus, potassium, sulphur, and zinc were applied as a basal dose in the forms of triple super phosphate, muriate of potash and gypsum, (Boron was deleted) respectively. The nitrogen was top dressed in the form of urea in three equal splits: 6 DAT (day after transplanting), 27 DAT and 45 DAT. Twenty nine days old 3 to 4 rice seedlings per hill were transplanted maintaining a hill spacing of 25 cm × 20 cm. Weed was controlled by applying herbicide (Pretilachlor) at 7 DAT followed by a hand weeding at 27 DAT. Irrigation, plant protection measures and other intercultural operations were done uniformly as per requirement.

The data on plant height, number of panicles per hill, length of panicle, number of spikelets per panicle, number of unfilled grain and 1000-grain weight were measured from randomly selected ten hill of each plot. Grain and straw yield were recorded from whole area of each plot. Analysis of variance was done following the experimental design with the help of the computer package MSTAT-C.

RESULTS AND DISCUSSION

Different level of fertilizer had significant influence on plant height of BRRI dhan50 rice. The highest plant height (78.51 cm) was observed in case of fertilizer dose N-P-K-S-Zn: 227.5-140-87.5-15.75-1.75 kg ha^{-1} (T_7) which was followed by T_6 (77.29 cm) and T_5 (76.83 cm) and the lowest (68.18 cm) was observed in T_1 (control, no fertilizer). One of the major reasons of this effect might be due to high dose fertilizer increased the plant height of BRRI dhan50. Plant height is mostly governed by the genetic makeup of the cultivar, but the environmental factors also influence it. The results are in agreement with data presented by Mohammad *et al.* (2002). Number of panicles was the result of the number of tillers produced during tillering stage and the proportion of effective tillers, which survived to produce panicle (Hossain *et al*. 2008). Number of panicle per hill of BRRI dhan50 was also influenced by rate of fertilizer application. The highest number of panicle per hill (14.27) was recorded in fertilizer dose N-P-K-S-Zn: 130-80-50-9-1 kg ha^{-1} (T_4). The lowest number of panicle per hill (9.26) was found in T_1. The differences among the fertilizer doses in respect of panicle length were found to be statistically significant (Table 1). The longest panicle (18.03 cm) was found in fertilizer dose N-P-K-S-Zn: 227.5-140-87.5-15.75-1.75 kg ha^{-1} (T_7). The smallest panicle (14.61 cm) was observed in control treatment (no fertilizer). It is evident from the Table 1 that, number of spikelet $panicle^{-1}$ was the highest (121.6) in fertilizer dose N-P-K-S-Zn: 227.5-140-87.5-15.75-1.75 kg ha^{-1} (T_7). On the other hand, the treatment T_1 (control) produced the lowest number of spikelet per panicle (109.7). The data on number of unfilled grain revealed that fertilizer dose N-P-K-S-Zn: 227.5-140-87.5-15.75-1.75 kg ha^{-1} (T_7) resulted maximum number of unfilled grain (28.03%) followed by T_6 (25.28%), whereas the lowest number of unfilled grains (12.76%) was recorded in T_8 (cow dung 20 t ha^{-1}). Analysis of the data revealed that the 1000-grain weight among the treatments was differed significantly (Table 1). The highest thousand grain weight (18.97 g) was found from treatment T_8 (cow dung 20 t ha^{-1}). On the other hand, treatment T_1 (control) produced the lowest 1000-grain weight (17.27 g). Application of nitrogen with other fertilizer beyond the accepted rate decreased grain yield. Higher levels of nitrogen application increase tallness and make the crop more soft and succulent and prone to lodge around panicle initiation stage that led to decrease in grains per panicle and increased spikelet sterility resulting lower grain yield. Similar nature of response was also observed by BRRI (2002) in *Aman* season. It is observed that, there was significant difference in grain yield among the doses of fertilizer (Table 1). The highest grain yield (5.23 t ha^{-1}) was recorded in treatment T_4 (N-P-K-S-Zn: 130-80-50-9-1 kg ha^{-1}). The treatment T_3 and T_8 produced 4.95 t ha^{-1} and 4.83 t ha^{-1} grain yields, respectively; and these are statistically similar to the treatment T_4. On the other hand the lowest grain yield (3.07 t ha^{-1}) was recorded in treatment T_7. These findings are supported by Sidhue *et al*. (2004). Straw yield was increased according to the increase of fertilizer rate in BRRI dhan50. The highest straw yield (13.06 t ha^{-1}) was found in fertilizer dose N-P-K-S-Zn: 227.5-140-87.5-15.75-1.75 kg ha^{-1} (T_7). The lowest straw yield (8.30 t ha^{-1}) was recorded in control (T_1). Study of the data revealed that, a significant difference between the harvest indexes of the doses of fertilizer was observed. Application of cow dung at the rate of 20 t ha^{-1} (T_8) produced the highest harvest index (44.80%) which was similar to treatments T_3 and T_2 (45.03%). The lowest harvest index (23.57%) was found in the highest dose of chemical fertilizer (T_7).

Table 1. Yield and other agronomic characters of BRRI dhan50 under different fertilizer management in Eastern Surma Kushiyara Flood Plain

Treatments	Plant height (cm)	No. of Panicles hill^{-1}	Length of panicle (cm)	No. of spikelets panicle^{-1}	Percent (%) unfilled grain	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
T_1	68.18 e	9.26 f	14.61 f	109.7 d	13.28 e	17.27 c	3.55 ef	8.30 e	42.71 ab
T_2	72.19 d	11.13 e	15.87 e	115.4 c	14.98 e	18.78 a	4.30 cd	9.57 d	45.03 a
T_3	74.31 c	12.94 cd	16.12 de	115.6 c	17.30 d	18.87 a	4.95 ab	11.00 c	45.03 a
T_4	76.07 b	14.27 a	16.83 cd	116.8 bc	20.17 c	18.72 a	5.23 a	11.77 b	44.47 a
T_5	76.83 b	13.15 bcd	17.18 bc	116.9 bc	23.61 b	18.31 b	4.65 bc	12.30 b	37.92 c
T_6	77.29 b	13.75 abc	17.61 ab	119.7 ab	25.28 b	18.31 b	3.91 de	12.30 ab	31.51 d
T_7	78.51 a	13.94 ab	18.03 a	121.6 a	28.03 a	18.26 b	3.07 f	13.06 a	23.57 e
T_8	74.80 c	12.85 cd	16.55 cde	116.5 bc	12.76 e	18.97 a	4.83 ab	10.80 c	44.80 a
T_9	74.25 c	12.39 d	16.54 cde	116.1 c	17.83 d	17.93 b	4.15 d	10.57 c	39.34 bc
CV (%)	2.94	3.86	2.59	3.63	6.59	1.19	6.45	3.54	5.71

CONCLUSION

The results obtained from present study indicate that, the highest grain yield (5.23 t ha^{-1}) was found in treatment T_4 (N-P-K-S-Zn: 130-80-50-9-1 kg ha^{-1}). The treatments T_3 and T_8 produced 4.95 t ha^{-1} and 4.83 t ha^{-1} grain yields, respectively; and these are statistically similar to the treatment T_4. On the other hand the lowest grain yield (3.07 t ha^{-1}) was recorded in treatment T_7, which is the maximum rate of chemical fertilizer. Therefore, application of fertilizer at the rate of N-P-K-S-Zn: 97.5-60-35.5-6.75-0.75 kg ha^{-1} or application of cow dung at the rate of 20 t ha^{-1} would be used for maximum yield of BRRI dhan50 rice in Sylhet region of Bangladesh. Judicious fertilizer management practices need to be established and followed to improve nutrient use efficiency leading to desirable grain yield of rice.

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