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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON THE PERFORMANCE OF *BORO* RICE

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ABSTRACT

The experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University (BAU), Mymensingh during the period from January to June 2016 with a view to finding out the effect of integrated nutrient management on the performance of *boro* rice. The experiment comprised of two varieties namely BRRI dhan28, BRRI dhan29 and seven integrated nutrient management practices viz. BRRI recommended dose, 75% of BRRI recommended dose + 25% N from cowdung, 50% of BRRI recommended dose + 50% N from cowdung, 25% of BRRI recommended dose + 75% N from cowdung, 75% of BRRI recommended dose + 25% N from poultry manure, 50% of BRRI recommended dose + 50% N from poultry manure, 25% of BRRI recommended dose + 75% N from poultry manure. The experiment was laid out in a split plot design with three replications. Variety exerted significant influence on yield and plant characters of *boro* rice. BRRI dhan29 produced the higher plant height (88.28cm), panicle length (22.47cm), number of grains panicle^{-1} (120.54), grain yield (5.44 t ha^{-1}), straw yield (5.92 t ha^{-1}) and harvest index (47.80%) while BRRI dhan28 had the higher number of total tillers hill^{-1} (13.39) and weight of 1000-grain (25.00gm). The highest number of total tillers hill^{-1} (13.82.), length of panicle (22.34 cm), number of grains panicle^{-1} (122.74), weight of 1000-grains (24.57 g), grain yield (6.40 t ha^{-1}) and harvest index (50.72%) were obtained at the treatment with 25% of BRRI recommended dose + 75% N from poultry manure. The highest plant height (89.78 cm), straw yields (10.89 t ha^{-1}) were obtained from the treatment with 50% of BRRI recommended dose + 50% N from poultry manure. The interaction between varieties and integrated nutrient management showed significant effect on the studied characters. The highest number of total tillers hill^{-1} (15.47), weight of 1000-grain (25.07 g) were obtained from the interaction between variety BRRI dhan28 and 25% of BRRI recommended dose + 75% N from poultry manure. The highest number of grains panicle^{-1} (140.05), grain yield (6.47 t ha^{-1}) and harvest index (50.91%) were obtained from the interaction of variety BRRI dhan29 with 25% of BRRI recommended dose + 75% N from poultry manure. The lowest number of total tillers hill^{-1} (9.31), grain yield (4.36 t ha^{-1}), and harvest index (45.11%) were obtained from the interaction of the variety BRRI dhan29 with BRRI recommended dose of fertilizer.

Key words: Nutrient management, BRRI dhan29, yield.

Introduction

Integrated nutrient management is imperative for crop production in a sustainable way. Among the available sources of N, cowdung and poultry manure are rich in N content. Cowdung is the commonly practices organic manure for crop cultivation in Bangladesh. The long term research reveals that addition of cowdung at the rate of 5 t ha^{-1} improved the rice productivity as well as prevented the soil resources from degradation (Bhuiyan, 1994). Poultry manure is also the most important considering factor. Approximately 75% of the total nitrogen in poultry manure are available for plant during the year of application. When poultry manure is applied with nitrogenous fertilizers, it helps to release the nutrient elements slowly during the period of crop growth. Application of urea in combination with cowdung may enhance the productivity of rice. So, integrated use of organic manures and inorganic fertilizers can contribute to increase in the N content of rice soil as well as to increase in long term productivity and enhancement of ecological sustainability. Experiment with urea N in combination with poultry manure and cowdung in rice found that application of manures and different doses of urea (N fertilizer) significantly increased the yield components and grain and straw yields (Rahman *et al*., 2009). Moreover, a suitable combination of variety and rate of fertilizer dose is necessary for better yield. Though rice is one of the most important crops of the world, enough information regarding the varieties of rice and their response to organic manure and nitrogen

are scarce. Extensive research works are necessary to find out appropriate variety and optimum rate of poultry manure, cowdung in combination with inorganic fertilizers to obtain satisfactory yield and quality of rice. Keeping the above points in view the present study was undertaken to achieve the objectives: i) to observe the effect of variety, ii) to know the effect of integrated nutrient management and iii) to find out the effect of interaction of variety and integrated nutrient management on performance of *boro* rice.

Materials and Methods

The experiment work was carried out at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, during the period from January to June 2016 with a view to finding out the effect of integrated nutrient management on the performance of *boro* rice. The experiment consisted of two of *boro* rice varieties namely, BRRI dhan28, BRRI dhan29 and seven integrated nutrient management practices viz. BRRI recommended dose (T_1), 75% of BRRI recommended dose + 25% N from cowdung (T_2), 50% of BRRI recommended dose + 50% N from cowdung (T_3), 25% of BRRI recommended dose + 75% N from cowdung (T_4), 75% of BRRI recommended dose + 25% N from poultry manure (T_5), 50% of BRRI recommended dose + 50% N from poultry manure (T_6), 25% of BRRI recommended dose + 75% N from poultry manure (T_7). The experiment was laid out in a split plot design with three replications. The unit plot size was 7.5m^2 (3.0 m × 2.5 m) cowdung and poultry manure were incorporated into the soil ten days before transplanting of seedlings. The full doses of TSP, MoP, gypsum and $ZnSO_4$ were applied uniformly in all the plots well before transplantation of seedlings. The first installment of urea was applied uniformly at 15 days after transplanting. The second and third installments were top dressed at 30 and 45 days after transplanting (DAT). Seedlings of 45 days age were transplanted at the rate of 3 seedlings $hill^{-1}$ with 25 cm × 15 cm spacing. Other intercultural operations were done as and when necessary. The crop was harvested at full maturity on 2 May 2016. From each plot 5 randomly selected hills excluding border rows were randomly selected and uprooted from each unit plot prior to harvest at maturity for recording data on yield contributing characters. The data were compiled and tabulated in proper form for statistical analysis. The recorded data on various plant characters were statistically analyzed to find out the significance of variation resulting from the experimental treatments. The mean of all treatments were calculated and the analysis of variance for each of the characters under study was done by F (variance) ratio. The difference among treatment means was compared by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

Effect of variety

The tested varieties (BRRI dhan28, BRRI dhan29) had significant influence on almost all the parameters (Table 1). BRRI dhan29 produced the highest plant height (88.28 cm), panicle length (22.47 cm), number of grains per panicle (120.54), grain yield (5.44 t ha^{-1}), straw yield (5.92 t ha^{-1}), harvest index (47.80%) as shown in Table 1& Figs. 1-2. On the other hand, BRRI dhan28 had the highest number of total tillers $hill^{-1}$ (13.39) and weight of 1000-grain (25.00 g). Variation in plant height due to variety might be because of their genetic potentiality. T_7 treatment produced the higher grain yield due to highest number of effective tillers $hill^{-1}$ and highest number of grains $panicle^{-1}$ which ultimately contributed to grain

Effect of integrated nutrient management

The results presented in Table 2 and Fig. 3-4 revealed that optimum use of organic and inorganic fertilizer treatment T_7 (25% of BRRI recommended dose + 75% N from poultry manure) produced the highest number of total tillers $hill^{-1}$ (13.82), length of panicle (22.34 cm), number of grains $panicle^{-1}$ (122.74), weight of 1000-grain (24.57 g), grain yield (6.40 t ha^{-1}) and harvest index (50.72%). The highest plant height (89.78 cm), straw yield (10.89 t ha^{-1}) were obtained from T_6 treatment (50% of BRRI recommended dose + 50% N from poultry manure). Increased plant height with the treatment of poultry manure plus urea might be because of availability of nitrogen in sufficient amount for the rice plant throughout the life cycle.

Interaction effect of variety and integrated nutrient management

The interaction between varieties and integrated nutrient management showed significant effect on the studied characters. The highest number of total tillers hill^{-1} (15.47), weight of 1000-grain (25.07 g) were obtained from the interaction between variety BRRI dhan28 and the fertilizer dose with 25% of BRRI recommended dose + 75% N from poultry manure (Table 3).

Table 1. Effect of variety on the performance of *boro* rice

Variety	Plant height (cm)	Total tillers hill^{-1} (no.)	Length of panicle (cm)	1000-grain weight (g)	Harvest index (%)
BRRI dhan28 (V_1)	85.95b	13.39a	21.56b	25.00	47.07b
BRRI dhan29 (V_2)	88.28a	10.74b	22.47a	23.91	47.80a
CV %	4.12	4	5.14	4.55	7.22
Level of sig.	**	**	**	NS	**

Table 2. Effect of integrated nutrient management on the performance of *boro* rice

Variety	Plant height (cm)	Total tillers hill^{-1} (no.)	Length of panicle (cm)	1000-grain weight (g)	Harvest index (%)
T_1	86.55	10.17d	22.13	24.50	45.40c
T_2	87.17	11.64c	22.65	24.40	46.02c
T_3	84.43	11.74c	21.08	24.38	47.26b
T_4	86.80	11.80c	22.03	24.40	47.49b
T_5	86.97	12.09c	21.66	24.40	47.63b
T_6	89.83	13.18b	22.23	24.56	47.52b
T_7	88.03	13.82a	22.34	24.57	50.72a
CV %	4.12	4	5.14	4.55	7.22
Level of sig.	NS	**	NS	NS	**

Table 3. Interaction effect of variety and integrated nutrient management on the performance of *boro* rice

Treatment	Plant height (cm)	Total tillers hill^{-1} (no.)	Length of panicle (cm)	Grains per panicle (no.)	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
V_1T_1	87.23	11.02de	21.79	81.29i	25.04	4.44ef	5.27f	45.69def
V_1T_2	85.27	13.40b	21.97	85.43h	25.06	4.51ef	5.46def	45.20ef
V_1T_3	82.80	13.15b	20.36	87.52h	25.03	4.89d	5.64cde	46.44def
V_1T_4	85.40	12.73bc	21.85	95.18g	25.06	5.00cd	5.69cde	46.78b-e
V_1T_5	85.27	13.00b	21.51	93.51g	25.05	5.37b	5.77cd	48.22bc
V_1T_6	88.87	14.93a	21.71	96.19g	24.72	5.57b	6.37ab	46.66c-f
V_1T_7	86.80	15.47a	21.75	105.43f	25.07	6.34a	6.20b	50.53a
V_2T_1	85.87	9.31g	22.47	105.72f	23.96	4.36f	5.30f	45.11f
V_2T_2	89.07	9.87fg	23.33	113.90e	23.74	4.77de	5.42ef	46.85bcd
V_2T_3	86.07	10.33ef	21.81	114.41e	23.73	5.27bc	5.69cde	48.09bc
V_2T_4	88.20	10.86de	22.22	117.81d	23.74	5.46b	5.86c	48.21bc
V_2T_5	88.67	11.18d	21.80	121.18c	23.75	5.61b	6.32ab	47.03bcd
V_2T_6	90.80	11.43d	22.75	130.73b	24.40	6.18a	6.58a	48.38b
V_2T_7	89.27	12.18c	22.93	140.05a	24.07	6.47a	6.24a	50.91a
CV %	4.12	4.00	5.14	6.2	4.55	5.15	5.47	7.22
Level of sig.	NS	**	NS	**	NS	**	*	*

In a column, figure with same letter(s) or without letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

**= Significant at 1% level of probability, NS=Not significant

The highest number of grains panicle^{-1} (140.05), grain yield (6.47 t ha^{-1}) and harvest index (50.91%) were obtained from the interaction between variety BRRI dhan29 and the fertilizer dose with 25% of BRRI recommended dose + 75% N from poultry manure. The lowest number of total tillers hill^{-1} (9.31), number of effective tillers hill^{-1} (7.10), grain yield (4.36 t ha^{-1}) and harvest index (45.11%) were obtained from the interaction of variety BRRI dhan29 and the fertilizer dose with BRRI recommended dose. Howeveer it can be stated that the highest grain yield (6.40 t ha^{-1}) was obtained from T_7 treatment (25% of BRRI recommended dose + 75% N from poultry manure) and the lowest grain yield (4.40 t ha^{-1}) was found in T_1 treatment (BRRI recommended dose).

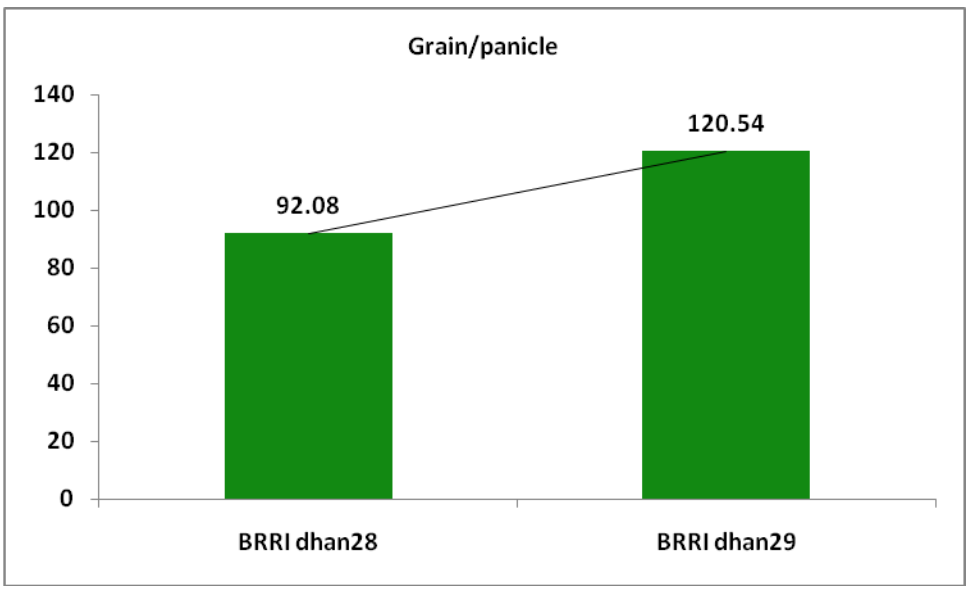

Fig. 1. Effect of variety on grain per panicle of *boro* rice

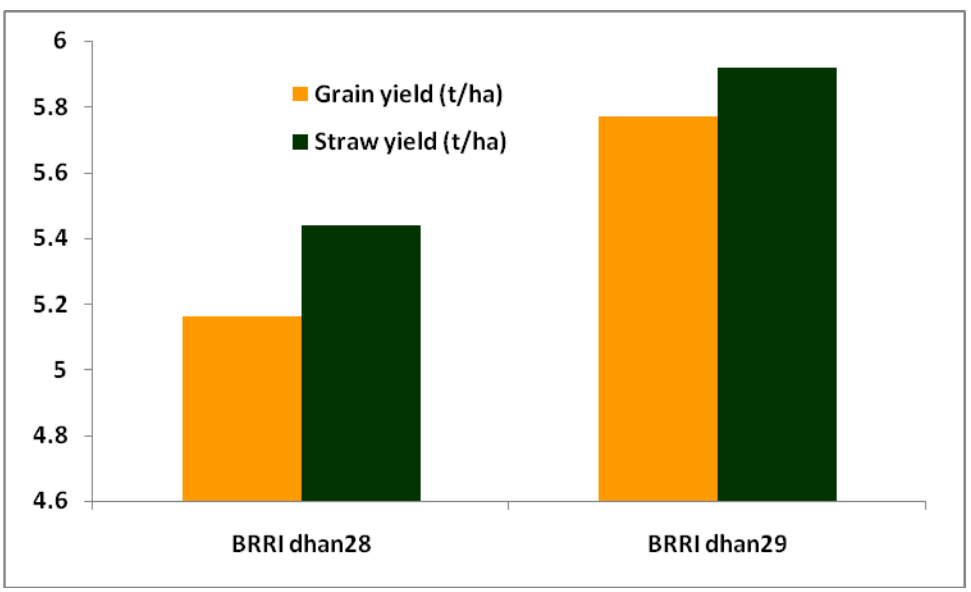

Fig. 2. Effect of variety on grain and straw yield *boro* rice

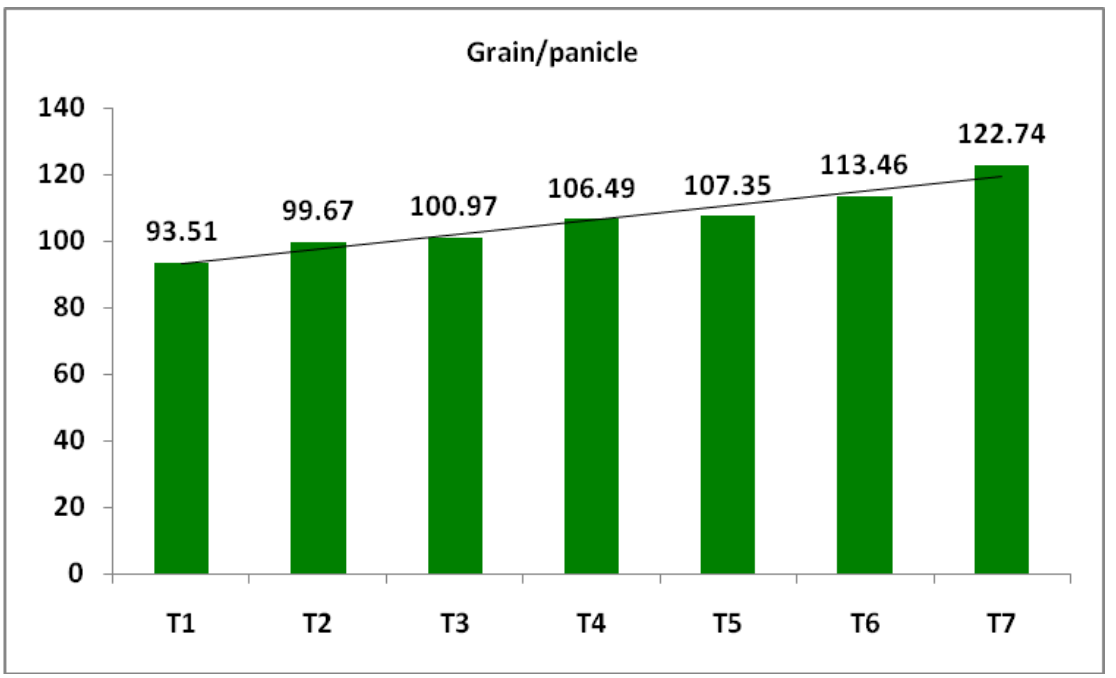

Fig. 3. Effect of integrated nutrient management on grain per panicle *boro* rice

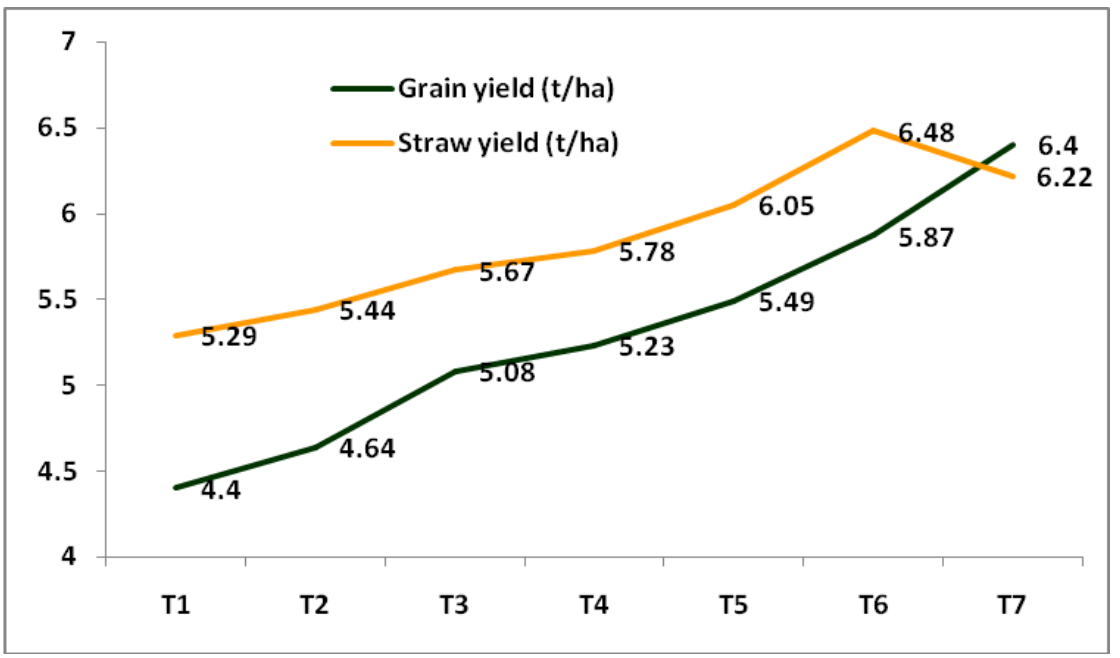

Fig. 4. Effect of integrated nutrient management on grain and straw yield *boro* rice

Conclusion

It can be concluded that 25% of BRRI recommended dose with 75% N from poultry manure could be the best possible combination for the better yield of *boro* rice varieties. BRRI dhan29 appeared as the best variety in terms of grain yield.

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