



## CORRELATION STUDY OF AMAN RICE UNDER MIXED FERTILIZER APPLICATION

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### ABSTRACT

A field experiment was undertaken to determine the contribution of yield components to yield of Aman rice grown under different levels of mixed fertilizers. Three high yielding Aman rice varieties (BR11, BRRI dhan31 and BRRI dhan32) and six fertilizer levels constituted the treatment variables. Six fertilizer levels were no fertilizer, mixed fertilizer at the rate of 100, 200, 300 and 400 kg ha<sup>-1</sup> and individual fertilizer at the rate of 250 kg ha<sup>-1</sup>. Results showed that applied fertilizers had profound effect on yield components of all the three rice varieties of Aman rice. Among the yield components, response was maximum in tiller production where the highest number of tillers (299 m<sup>-2</sup>) was recorded in the variety BRRI dhan31 with individual fertilizer which was identical to the tillers (295 m<sup>-2</sup>) of the variety BRRI dhan32 produced with the mixed fertilizer at the rate of 300 kg ha<sup>-1</sup>. Correlation study indicated that contribution of tiller number is the highest to the yield of Aman rice varieties as indicated by 1.0 correlation coefficient. Regression analysis revealed that maximum yield of 5.10, 5.35 and 5.70 t ha<sup>-1</sup> of BR11, BRRI dhan31 and BRRI dhan32 may be obtained by mixed fertilizer optimized at 250, 370 and 360 kg ha<sup>-1</sup>, respectively.

**Keywords:** Aman rice, genotypic variation, mixed fertilizer

### Introduction

Rice is staple food and it has tremendous influence on agrarian economy of Bangladesh. Rice alone constitutes about 95% of the food grain production in Bangladesh (Julfiquare *et al.* 1998). Among different groups of rice, Aman season covers about 47.73% of total rice area and it contributes about 33.44% of the total rice production in the country (BBS 2017). Although Aman covers the largest area but its yield is only 1.9 t ha<sup>-1</sup> which is much below the potential yield. The reasons for low yield of Aman rice are mainly associated with lack of use of improved varieties, balanced fertilizer and modern techniques of cultivation. Therefore, there are opportunities to increase yield of Aman rice by adoption of modern varieties and judicious application of chemical fertilizers.

Recently, mixed fertilizers are becoming new concern for enhancement of crop production. Mixed fertilizers are the products containing two or more of the major plant nutrients such as nitrogen, phosphorus, potassium and sulphur manufactured by a process involving chemical reaction between basic components resulting in a granulated or piled homogenous material. Mixed fertilizers are used

to supply the entire fertilizer requirements of a crop by the application of one product. Although various mixed fertilizers (Bengal, Akter, Aftab) are becoming available in the market, but information relating yield components and yield of modern Aman rice grown under mixed fertilizers is not scientifically available. Therefore, this study was undertaken to quantify the contribution of yield components to yield of three modern Aman rice varieties grown under different levels of mixed fertilizers.

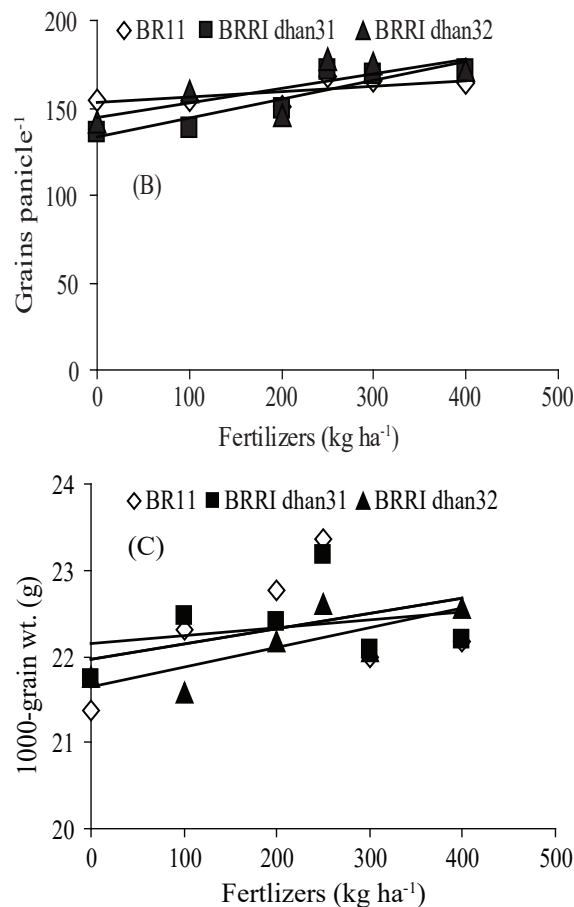
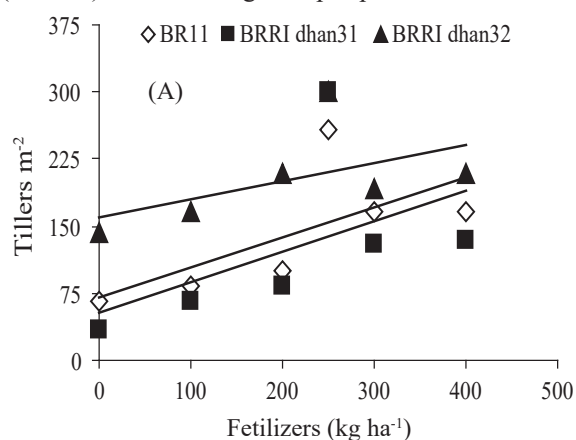
### Materials and Methods

The experiment was carried out at the Agronomy farm, Bangladesh Agricultural University, Mymensingh during the Aman season of 2012. The experimental field was low in organic matter with poor soil fertility. The experiment was laid out in a randomized complete block design with three replications. Three high yielding Aman rice varieties (BR11, BRRI dhan31 and BRRI dhan32) and six fertilizer levels constituted the treatment variables. Six fertilizer levels were control (no fertilizer), mixed fertilizer at the rate of 100, 200, 300 and 400 kg ha<sup>-1</sup> and individual fertilizer at the rate of 250 kg ha<sup>-1</sup>. For preparation of 100

kg mixed fertilizer the proportion of urea, triple super phosphate, muriate of potash and gypsum were 35, 30, 25 and 10 kg, respectively. The trade name of the mixed fertilizer was Bengal mixed fertilizer. In individual fertilizer amount of urea, triple super phosphate, muriate of potash and gypsum were 90, 60, 60 and 40 kg ha<sup>-1</sup>, respectively. Thirty-day-old seedlings of rice were on 30 July 2012 following 25 cm × 15 cm planting configuration. Mixed fertilizer was applied at the time of final land preparation. For individual fertilizer, urea was top dressed in three equal splits for individual fertilizer. One third of urea was applied at 15 days after transplanting and the remaining two third were applied in two equal splits at 30 and 45 days after transplanting. Intensive care was taken during the whole growing period to ensure adequate growth and development of the crop. Data on tillers m<sup>-2</sup>, grains panicle<sup>-1</sup>, 1000-grain weight and grain yield were recorded. Grain yield was adjusted at 14% moisture content. Data were analyzed and correlation coefficients as well as regression coefficient were determined according to Gomez and Gomez (1984).

## Results and Discussion

Variety and fertilizer exerted significant influence on number of effective tillers of Aman rice varieties. Number of effective tillers of Aman rice increased with the increase of fertilizer rates (Figure 1a). Among the fertilizer rates, individual fertilizer (250 kg ha<sup>-1</sup>) produced the highest number of effective tillers in all the varieties which was statically similar to the tiller number produced at 300 kg ha<sup>-1</sup> mixed fertilizer. The highest number of effective tillers (299 m<sup>-2</sup>) was recorded from BRRI dhan31 ' individual fertilizer followed by BRRI dhan32 ' individual fertilizer (220 m<sup>-2</sup>) and BRRI dhan32 ' mixed fertilizer (295 m<sup>-2</sup>). Number of grains per panicle of rice varieties



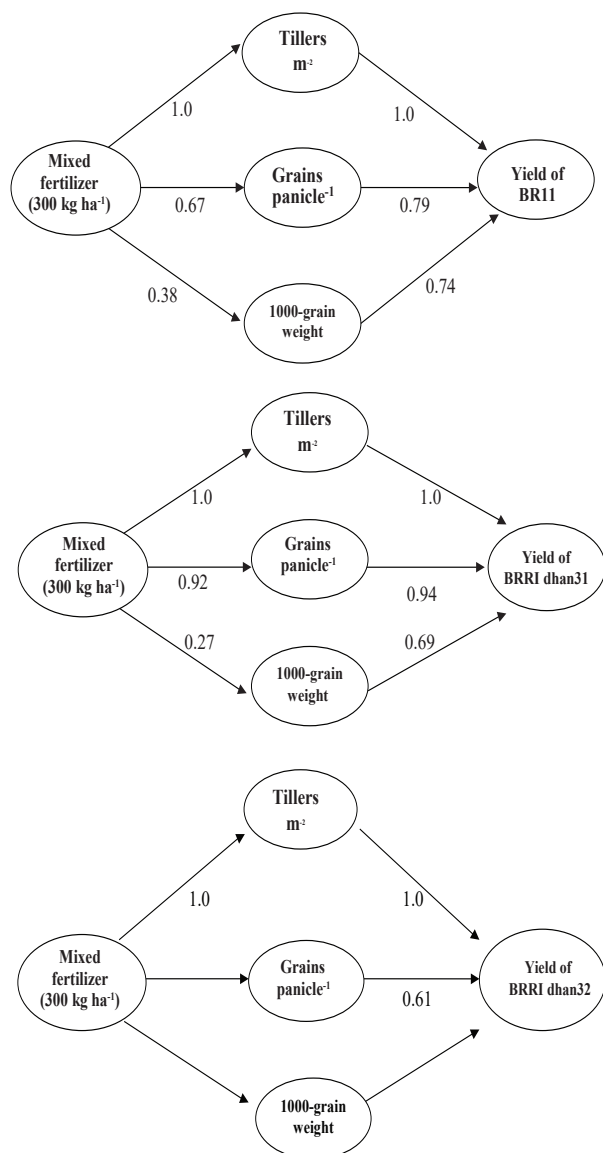
**Figure 1.** Yield contributing characters of Aman rice varieties as influenced by fertilizer rates

also influenced by different fertilizer levels (Figure 1A). Aman rice varieties, BR11, BRRI dhan31 and BRRI 32 produced the highest number of grains per panicle (160) with individual fertilizer which was statistically identical to the number of grains per panicle (158) of mixed fertilizer at 300 kg ha<sup>-1</sup> (Figure 1B). Thousand seed weight of rice varieties however was not significant under different levels of fertilizers (Figure 1C). Numerically, the highest 1000-grain weight (23.4 g) was recorded from BR11 with individual fertilizer although it was the lowest in same variety under control treatment.

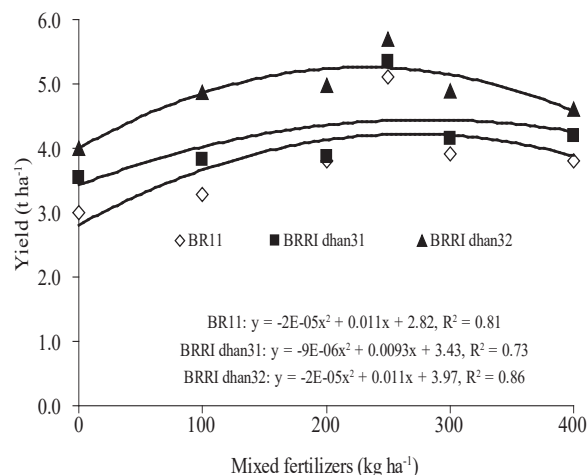
The grain yield of Aman rice varieties showed a strong and significant correlation with yield components under mixed fertilizer applied at 300 kg ha<sup>-1</sup> (Figure 2). The correlation coefficient between fertilizers and tillers was 1.00 and subsequent tiller and yield was also 1.0 which indicated that the grain yield strongly depends on applied fertilizer and tiller production of the rice varieties. Number of tillers per unit area is the most important

component of rice yield. Fertilizer applications provide more nutrients that played a vital role in cell division resulting in higher number of tillers  $m^{-2}$  and finally higher grain yield. Haque and Ahmed (1999) also found similar result in wet land rice.

There was a positive correlation between grain yield and number of grains per panicle of Aman rice varieties under the application of mixed fertilizer at the rate of 300  $kg\ ha^{-1}$  (Figure 2). The correlation coefficient between grains per panicle and yield were 0.79, 0.94 and 0.61 for BR11, BRRI dhan31 and BRRI dhan32, respectively. Applied fertilizers ensure proper amount and continuous supply of N, P, K and S to the rice plant and produced higher



**Figure 2.** Schematic representation of the correlations between mixed fertilizer and yield components of three varieties of Aman rice



**Figure 3.** Response of Aman rice varieties under different levels of fertilizers

number of grains per panicle. Accordingly it correlated well to grain yield which confirmed the findings of Khan and Moula (1987). There was weak relationship observed between fertilizer dose and 1000-grain weight of Aman rice (Figure 2). The correlation coefficients of these parameters were 0.38, 0.27 and 0.78 for BR11, BRRI dhan31 and BRRI dhan32, respectively under mixed fertilizer at 300  $kg\ ha^{-1}$ . The weight of 1000-grain did not affect by applied fertilizer because this character is genetically controlled (Yasin and Corpuz 1989).

The yield of rice varieties showed positive response to different fertilizer levels. The response was significant and quadratic in fashion (Figure 3). The response equation  $y = -2E-05x^2 + 0.011x + 2.82$ ,  $R^2 = 0.81$  explained the relationship between fertilizer doses and BR11. For BRRI dhan31, the regression equation was  $y = -9E-06x^2 + 0.0093x + 3.43$ ,  $R^2 = 0.73$  and for BRRI dhan32, the equation was  $y = -2E-05x^2 + 0.011x + 3.97$ ,  $R^2 = 0.86$ . The estimated mixed fertilizer doses were 250, 370 and 360  $kg\ ha^{-1}$  for obtaining maximum yield of 5.10, 5.35 and 5.70  $t\ ha^{-1}$  from the rice varieties BR11, BRRI dhan31 and BRRI dhan32, respectively. Other authors (Haque and Biswas 1990, BRRI 1992, Singh *et al.* 2003) also reported that multi-nutrient fertilizers were effective for increasing yield of rice.

## Conclusion

From the present study, it may be concluded that mixed fertilizer 250  $kg$  for BR11, 370  $kg$  for BRRI dhan31 and 360  $kg\ ha^{-1}$  for BRRI dhan32 is optimum for maximum production of rice during Aman season of Bangladesh.



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