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EFFECTS OF MANURES AND FERTILIZERS FOR MAXIMIZING THE YIELD OF BRRI DHAN48

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ABSTRACT

A field experiment was conducted at the Soil Science Field Laboratory Khulna University (KU), Khulna during aman season of 2018 to evaluate the effects of manures and fertilizers for maximizing the yield of BBRI dhan48. The soil of the experimental field belongs to 'Sonatala' Soil Series having silt loam texture, pH 6.18, organic matter content 2.15%, total N 0.124%, available P 6.51 ppm, exchangeable K 0.074 me/100 g soil, available S 14.85 ppm and CEC 12.5 me/100 g soil. The experiment containing six treatments was laid out in a randomized complete block design (RCBD) with four replications. The treatments were T_0= Control, T = STB-CF (HYG), T_2= CD + STB-CF (HYG), T_3= PM + STB-CF (HYG), T_4= COM + STB-CF (HYG) and T_5= Farmers' practice (FP). Organic manures including cowdung, poultry manure and compost were appliedto the experimental plots @ 5, 3 and 5 t ha^{-1}, respectively. The recommended dozes of N, P, Kand S supplied from urea, TSP, MoP and gypsum were 90, 15, 60 and 15 kg ha^{-1}, respectively. Yield contributing characters like plant height, effective tillers $hill^{-1}$, panicle length, grains $panicle^{-1}$ and filled grains $panicle^{-1}$ and grain and straw yields of BRRI dhan49 were significantlyinfluenced by the application of manures and fertilizers. The highest grain yield of 4.87 t ha^{-1} was observed in the treatment T_3 [PM + STB-CF (HYG)] and the lowest value of 3.61 t ha^{-1} was found in T_0 (control). The straw yield ranged from 4.10 to 5.51 t ha^{-1} in different treatments. The NPKS contents and uptake by BRRI dhan48 were markedly influenced by manures andfertilizers. The treatment T_3 [PM + STB-CF (HYG)] was found to be the best combination ofmanures and fertilizers for obtaining the maximum yield of rice.

Key words: fertilizers, yield etc.

INTRODUCTION

Bangladesh is an agro-based country with a large population. The population of Bangladesh was 142.32 million and growth rate is 1.34 % in the year 2011 (BBS, 2011). Most of the people of the country depend on agriculture. The agriculture of our country is governed by intensive rice (*Oryza sativa)* cultivation. Rice (*Oryza sativa)* is the staple food crop in Bangladesh and the cropping pattern of the country is predominately rice-based. In Bangladesh, rice dominates over all other crops and covers 77 % of the total cropped area and 93% farmers grow rice. The total area and production of rice in Bangladesh are about 11.7 million hectares and 31.98 million metric tons, respectively (BBS, 2011).

The soil fertility status is gradually declining. The stagnating trend in the yield of major crops of the country has become an alarming issue for the scientist and policy makers (Bhuiyan, 1994). Low organic matter content of the soil, imbalanced use of chemicalfertilizers, less use of organic manures and inadequate attention given for its improvement and maintenances have made the situation difficult (Karim *et al.* 1994).

Before 1980's, deficiency of NPK was a major problem of Bangladesh soil but there after along with NPK deficiencies of S and Zn are frequently reported (Islam *et al*. 1986, Haque and Jahiruddin, 1994). Presently, there has been a great increase in fertilizer use yet the production of different nutrients used in the country is not balanced.

In general, organic manures play a vital role in improving soil physical, chemical and biological properties in addition to supplying sustain quantities of plant nutrients. Nambiar (1991) reviewed that integrated use organic manure chemical NPK fertilizers would be quitepromising only in providing greater stability in production, but also in maintaining soil fertility status.

Soil organic matter plays an important role in maintaining soil fertility and productivity. Organic matter acts as a reservoir of plant nutrients especially N, P, K and S and micro- nutrients and prevent leaching of the nutrients. The problem of nutrient deficiencies as well as nutrient mining caused by intensive cropping with HYV of rice and nutrient imbalance can be minimized by judicious application of nutrients through organic

manures. Losses of soil organic matter can only be replenished in the short term by application of organic matter such as manures.

Cowdung and poultry manure are the most popular and promising bulky organic manures produced from solid and liquid excreta of farm animals. They contain considerable amounts of essential nutrient elements required by plant growth. These are one kind of store house ofnutrients of plants. Hence an improvement and addition of a good amount of cowdung and poultry manure to the crop field is essential for fertility and productivity and maintenances ofthe soil.

Many farmer's use more amount of urea fertilizer than needed while they use less amount of other fertilizers such as triple superphosphate, muriate of potash and gypsum. They seldom use micronutrient fertilizers e.g. zinc sulphate, boric acid. This practice creates imbalance use of fertilizers which in turn produces a negative impact on crop production (Rijpma and Jahiruddin, 2004). Continuous use of inorganic fertilizer deteriorates soil properties and causes a nutrient imbalance of soil in addition to causing micronutrient deficiency. Further more, chemical fertilizers pollute soil and water making our environment even more harmful for both terrestrial as well as aquatic life. Application of inorganic fertilizer has always been expensive inputs for crop production, especially in a developing country like Bangladesh. In near future chemical fertilizer is likely to be even more costly. This situation is in turn will pose a serious threat to food security of vast millions of people of this country. In addition, global environment pollution can be reduced considerably by reducing the chemical fertilizers and increasing amount of organic fertilizers. It is true that production of crops can not be maintained by using only chemical fertilizers and similarity it is not possible obtain higher crop yield by using organic manures alone (Bair, 1990).

The problem of nutrient deficiencies as well as nutrient mining caused by intensive cropping with high yielding varieties of rice and nutrient imbalance can be minimized by judicious application of nutrients through organic manures or chemical fertilizers. The present research work was, therefore, undertaken with the following objectives.

1. To study the effect of manures and fertilizers on the growth and yield of BRRI dhan48
2. To evaluate the effect of manures and fertilizers on the nutrient content and uptake byBRRI dhan48.

REVIEW OF LITERATURE

Organic matter is the main sources of nutrient availability and maintenances of better physical, chemical and biological status of soil. Soil organic matter is the essential factor for sustainable soil fertility and crop productivity. An attempt has been made present a brief and pertinent review of literature in this chapter. Attention has been paid to the application of cowdung, poultry

manure and chemical fertilizers on the growth, yield and nutrient content of rice. Research works on rice and it response to manures and fertilizers have been carried out in the different rice growing countries of the world by many researchers. Available information's are reviewed below.

Effect of manures on the growth and yield of rice

Das (2011) observed that the highest grain yield highest grain (4.47 t ha^{-1}) was produced in treatment P_3 (PM at 7 t ha^{-1}) and the lowest grain yield (3.09 t ha^{-1}) was produced in treatment P_1 (no application of PM).

Murad (2011) observed the highest number of grains panicle (14.04) in T_7 (PM at 5 t ha^{-1}) and the lowest number of grains panicle (95.35) in T_1 (control).

Bastida *et al.* (2010) conducted an experiment and reported that compost has the unique ability to improve soil properties and the growing media physically, chemically and biologically.

Mohammadi *et al.* (2009) showed that long term application of fertilizers containing P, especially organic fertilizers usually increase the water soluble and available P of soil and at the same time may result in P accumulation in soil. Organic fertilizers may also increase the movement of P in the profile that could result in surface and ground water pollution. Average organic content in the soil increased as result of organic fertilizer applications. The increase was proportional to the rate of application and was highest for dairy manure and lowest for urban solid compost. Effect of sewage sludge application on available p content of soil was greater than its effect on the water extractable P.

Tejada *et al*. (2009) conducted an experiment and reported that among the advantages of compost as soil amendment is its potential to maintain soil organic matter, faster nutrient availability and increase soil microbial abundance and activity, thus enhancing soil quality and fertility.

Mobasser *et al*. (2005) reported that numbers of panicle/m were significantly higher in cowdung treated plots compared with the unfertilized control.

Ogbodo *et al.* (2005) conducted a field study to compare the response of rice to organic and inorganic manures at Abakaliki, Southeastern Nigeria, between 2002 and 2003 cropping seasons (April- November). However, organic manure application doses of over 20 t ha^{-1} reduced plant growth and grain yield. Sewage sludge and poultry droppings at 20 t ha^{-1} were therefore concluded to be a viable alternative to urea in rice production in the study area.

Reddy *et al.* (2004) conducted a field study for two years (2001 and 2002) on the farmers field in Kolar district (eastern dry zone, Karnataka, India) to study the effect of different organic manures on growth and yield of paddy under tank irrigation. PM and sewage sludge produced better growth components, viz., plant height, numbers of tillers hill, panicle length and 1000-grain weight.

Blum *et al.* (2003) in a greenhouse study reported that poultry manure at 30 kg^{-1} increased the number (approx.15-50%) and fresh mass (approx. 90200%) of emerging plants of Exposicao and Caipira. Soil pH and soil concentrations of Ca, K, Mg, N, P and Zn increased with increased poultry manure rates. The fruit yield of squash increased with the incorporation of poultry manure to the soil at 30 g kg^{-1}.

Umanah *et al.* (2003) conducted a field experiment to study the effect of different rates of PM on the growth, yield components and yield of upland rice cv. Faro43 in Nigeria, during the 1997 and 1998 early crop production seasons. The treatments comprised 0, 10, 20 and 30 t PM ha^{-1}. There was significant differences in plant height, internodes length, number of tillers $hill^{-1}$, panicle number stand number of grains panicle, and dry grain yield. There was no significant variation among treatments for 1000 grain weight.

Usman *et al.* (2003) conducted a field experiment to study the effect of organic amendment (FYM, PM) on the performance of rice cv. Basmti-2000 in Faisalabad, Pakistan. PM showed the maximum leaf area index (46.46 %). The treatment also produced the highest number of grains/panicle, 1000-grain weight and straw yield.

BRRI (2001) reported that application of only cowdung as a nitrogen source the sterility percentage (22%) over control (13%).

Saitoh *et al.* (2001) conducted a field study on the effects of organic fertilizers (cow and chicken manure) and pesticide on the growth and yield of rice cv. Nipponbare were examined from 1990 to 1999 in a paddy field in Okayama, Japan. In this experiment, rice was grown by pesticide-free organic cultivation with only 10% yield reduction. A possibility of cultural and biological control of weeds and insects was discussed.

Singh *et al.* (2001) reported that the application of FYM @ 10 t ha^{-1} produced 4.64% higheryield than the control.

Hemalatha *et al.* (2000) studied on the influence of organic manures: dhaincha, sun hemp and FYM on rice productivity, quality and soil fertilizer. They reported that all the sources of organic manures improved the rice yield, quality and soil fertility.

Bhattacharya *et al.* (1996) carried out an experiment in plastic pots 5 kg capacity with one hole at bottom and filled with 4 kg soil. They reported that the application of 2.59 g kg^{-1} FYM could produce about 2.0 g pot^{-1} grain as well as straw yield than no FYM treated soil.

MATERIALS AND METHODS

This chapter describes the materials used and methods followed in the experiment. The experiment was carried out at the Soil Science Field Laboratory Khulna University (KU), Khulna during aman season of 2018 using BRRI dhan48 as the test crop.

Experimental site and soil

The experiment was conducted at the Soil Science Field Laboratory Khulna University (KU), Khulna during aman season of 2018. The morphological, physical and chemical characteristics of the soil are presented in Table 3.1

Table 3.1 Morphological, physical and chemical characteristics of theExperimental soil

A. Morphological characteristics

Morphological feature	Characteristics
Location	Soil Science Field Laboratory Khulna University (KU), Khulna during aman season of 2018
AEZ	Old Brahmaputra Floodplain
Land type	Medium high land
General soil type	Non-calcareous Dark Grey Floodplain Soil
Parent material	Brahmaputra river borne deposit
Soil series	Sonatola
Drainage	Moderate
Topography	Fairly leveled

Cropping pattern	Rice-Rice

A. Physical and chemical characteristics

Characteristics		Value
Particle size analysis	Sand (%)	76.4
	Silt (%)	14.00
	Clay (%)	18.36
Textural class		Silt loam
pH		6.18
Organic matter (%)		2.15
Total nitrogen (%)		0.124
Available phosphorus (ppm)		6.51
Exchangeable K (me/100 g soil)		0.074
Available sulphur (ppm)		14.85
CEC (me/100 g soil)		12.50

Climate

The climate of the area is characterized by relatively high temperature with humidity and heavy rainfall with occasional gusty winds during kharif season (16 March - 15 October) and low temperature and humidity during rabi season (16 October - 15 March).

Land preparation

The land was prepared by ploughing and cross ploughing with power tiller and country plough. Then the land was laddered with traditional tools. All kinds of weeds, stubbles and crop residues were removed from the field before final ploughing and leveling.

Rice crop

BRRI dhan49, a high yielding variety of rice was used as the test crop in this experiment. The variety vas released by Bangladesh Rice Research Institute, Joydebpur, Gazipur in 2008. Life cycle of this variety is 135 days in aman season. Insect and pest attacks are comparatively less in BRRI dhan49.

3. 5 Lay out of the experiment

The experiment was laid out in Randomized Complete Block Design (RCBD) with four replications. There were six different treatment combinations. Each block was subdivided intosix unit plots. The treatments were randomly distributed to the unit plots in each block. The total numbers of plots were 24. The unit plot size was 4.0 m x 2.5 m. The spacing between the plants was separated from each other by a space of 25 cm. The lay out of the experiment hasbeen shown in Fig. 3.1

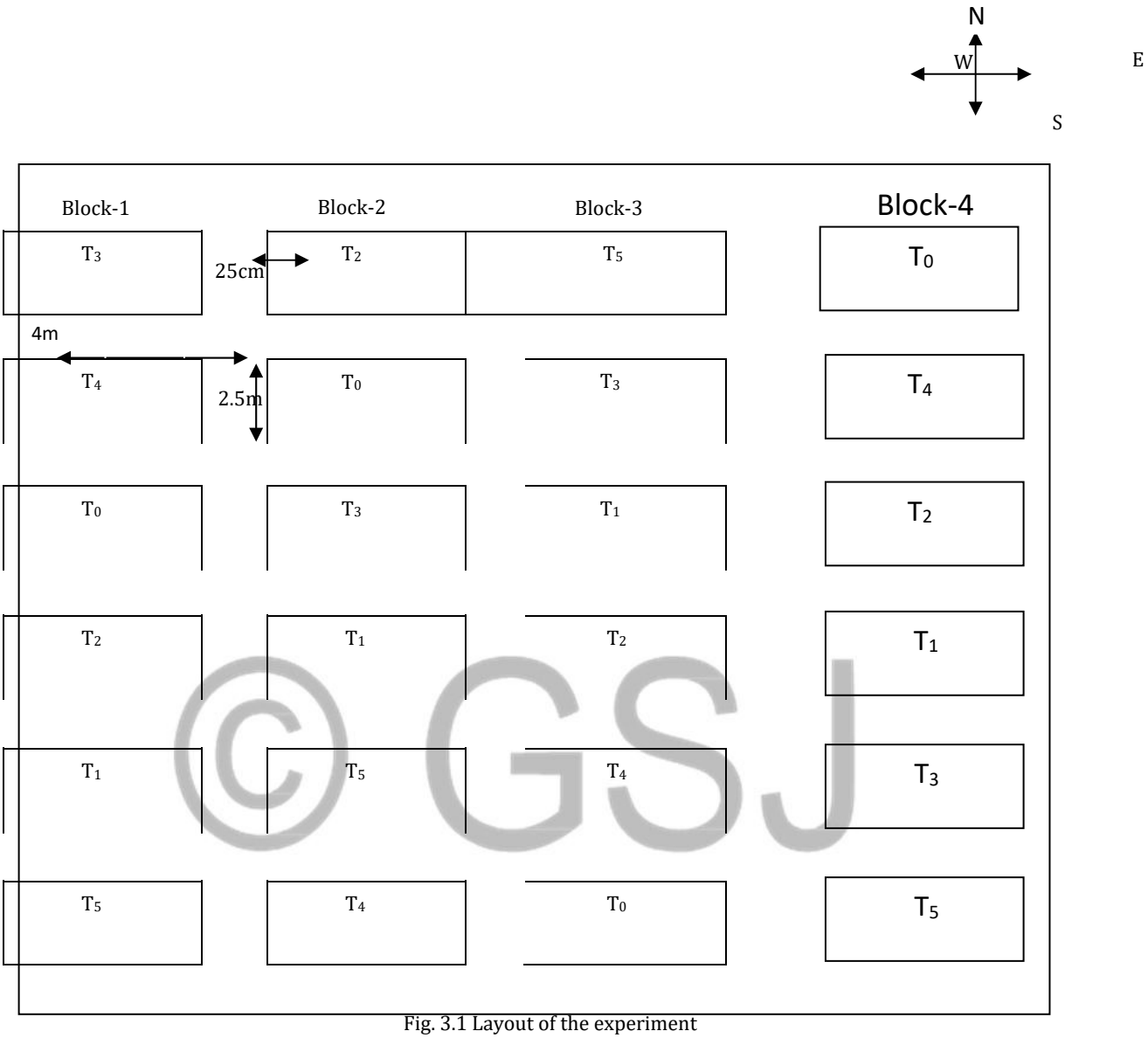

Fig. 3.1 Layout of the experiment

Treatments

The experiment comprised of six treatments including control. The treatments employed forthe experiment were as follows.

T_0 = Control

T_1 = STB-CF (HYG)

T_2 = CD + STB-CF (HYG) T_3 = PM + STB-CF (HYG)

T_4 = COM + STB-CF (HYG) T_5 = FP

Here, STB = Soil Test Basis, CF = Chemical Fertilizer, HYG = High Yield Goal, CD = Cowdung, PM = Poultry Manure, COM = Compost, FP = Farmer's Practice. Organic manures including cowdung, poultry manure and compost were applied to the experimental plots @ 5, 3 and 5 t ha^{-1}, respectively. The recommended dozes of N, P, K and S supplied from urea, TSP, MoP and gypsum were 90, 15, 60 and 15 kg ha^{-1}, respectively.

Application of manures and fertilizers

Triple super phosphate (TSP), muriate of potash (MoP), and gypsum were applied as basal dose to all the experimental plots. The amounts of N, P, K, and S in cowdung and poultry manure were deducted from recommended N, P, K and S fertilizer doses. Urea was applied in three equal splits. The first dose of urea was applied at 15 days after transplanting of rice seedlings. The rest doses of urea were top dressed at 30 days after transplanting (active tillering stage) and 45 days after transplanting (panicle initiation stage). Cowdung, poultry manure and compost were incorporated in the plots as per treatments at 10 days before transplanting of the rice seedlings. The manure was mixed thoroughly with the soil. The chemical composition of the cowdung, poultry manure and compost are presented in Table 3.2

Table 3.2 Nutrient contents in cowdung, poultry manure and compost

Name of manures	Nutrient contents (%)			
	N	P	K	S
Cowdung	0.57	0.47	0.67	0.20
Poultry manure	1.18	1.50	0.98	0.39
Compost	0.89	0.30	0.45	0.46

Transplanting of rice seedlings

The seedling of BRRI dhan48 was transplanted on 11 August, 2018 maintainingplant spacing of 20cm x 20cm. Three healthy seedlings were transplanted in each hill.

Intercultural operations

Intercultural operations were done for ensuring and maintaining the normal growth of thecrop. The following intercultural operations were done.

Irrigation

Necessary irrigations were provided to the plots from the deep tube well as and whennecessary during the growing period of the crop.

Weeding

The crop was infested with some weeds that were uprooted by hand weeder at 15 and 40days after transplanting.

Insect and pest control

There was no serious infestation of insect pest and disease in the field and no control measureswere adapted.

Harvesting

The crop was harvested at full maturity on December 22, 2018. The harvested crop of each plot was bundled separately and brought to the threshing floor. Grain and straw yields were recorded plot wise and expressed as t ha^{-1} on 14% moisture basis.

Collection and preparation of plant samples

Five hills were randomly selected from each plot at maturity to record the yield contributing characters like plant height (cm), numbers of total tillers $hill^{-1}$, numbers of effective tillers $hill^{-1}$, panicle length (cm), numbers of spike $panicle^{-1}$, numbers of grains $panicle^{-1}$ and 1000-grain weight (g). The selected hills were collected before crop harvest and necessary information's were

recorded accordingly. Grain and straw yields were recorded plot wise and expressed as sun dry basis. Grain and straw samples were kept for chemical analysis.

RESULTS

The experiment was carried out at Soil Science Field Laboratory Khulna University (KU), Khulna during study the response of BRRI dhan48 to nutrients supplied from manures and fertilizers. The results are presented in this chapter. The ANOVAs of different characters of BRRI dhan49 are presented in Appendices.

Yield components of BRRI dhan49

Plant height

The plant height of BRRI dhan48 increased significantly due to application of organic manures and chemical fertilizers (Table 4.1). All the treatments significantly increased the plant height over control and the highest value (94.25 cm) was recorded due to the application of poultry manure @ 3 t ha^{-1} in combination with chemical fertilizers T_3 [PM + STB-CF (HYG)] which was statistically similar with T_2 [CD + STB-CF (HYG)]. The lowest plant height (78.88 cm) was obtained in control (T_0). The treatments may be ranked in the order of $T_3 > T_2 > T_4 > T_1 > T_5 > T_0$ in terms of plant height.

Effective tillers $hill^{-1}$

Table 4.1 reveals the effect of manures and fertilizers on the number of effective tillers $hill^{-1}$. All the treatments caused an increasing effect on the number of effective tillers $hill^{-1}$over control. The number of effective tillers $hill^{-1}$ due to different treatments ranged from 9.00 to 13.50 and the minimum number was obtained in the control. The treatment T_3 [PM + STB-CF (HYG)] recorded the highest number of effective tillers $hill^{-1}$ which was similar with T_4 [COM + STB-CF (HYG)].

Grain yield

Results in Table 4.2 show that the grain yield of BRRI dhan48 was significantly influenced due to different treatments. The grain yield ranged from 3.61 to 4.87 t ha^{-1}. The lowest grain yield was obtained in the control (To). The highest grain yield was achieved in the treatment T_3 [PM + STB-CF (HYG)] which was identical with T_1 [STB-CF (HYG)] and T_4 [COM + STB-CF (HYG)] treatments. The grain yield due to different treatments may be ranked in the order of $T_3 > T_1 > T_2 > T_4 > T_5 > T_0$. The treatment under study resulted in 18.28% to 34.90% yield increase over control.

The treatment T_3 [PM + STB-CF (HYG)] gave the highest (34.90%) and the lowest (18.28%) yield increase over control, respectively. Table 4.2 reveals that BRRI dhan49 responded better to the nutrients supplied from organic manures rather than to chemical fertilizers.

Straw yield

Straw yield of BRRI dhan49 was also influenced significantly by different treatments under study. The straw yield ranged from 4.10 to 5.51 t ha^{-1} (Table 4.2). It was observed that the treatment T_3 [PM + STB-CF (HYG)] produced the highest straw yield which might be due to quick release of nutrients from poultry manure. The lowest straw yield was obtained in the treatment T_0 (control).The straw yields due to different treatments may be ranked in the order of $T_3 > T_2 > T_4 > T_1 > T_5 > T_0$.The

treatments under study resulted in 22.43% to 34.39% increase in straw yield over control. Table 4.2 shows that the treatment T_3 [PM + STB-CF (HYG)] gave the highest straw yield increase of 34.39% over control. Table 4.2 also indicates that organic manures served as the better source of nutrients in producing straw yields of rice.

DISCUSSIONS

In the present study the effects of manures and fertilizers on the growth parameters and yield as well as nutrient content and uptake by BRRI dhan48 has been elaborated. From the results it is observed that the yield contributing characters such as plant height, number of effective tillers hill^{-1}, panicle length, grains panicle^{-1}, filled grains panicle^{-1}, and 1000-grain weight are higher in T_3 treatment where poultry manure was applied in combination with fertilizers on IPNS basis as compared to those observed in other treatments. Organic manures were found better source of nutrients regarding their effects on yield attributes of rice. Among the manures, the poultry manure showed superior performance on the plant height. This might be due to slow release of nutrients from poultry manures and efficient utilization of nutrients by plants. These results are in agreement with Parvez *et al.* (2008) who observed that the plant height of rice was significantly influenced by the incorporation of organic manures and fertilizers. The effect of poultry manure and cowdung was more pronounced in producing the number of effective tillers hill^{-1} as compared to chemical fertilizers. These results are well corroborated with the findings of Rajni Rani *et al.* (2001) who found increased number of effective tillers hill^{-1} with the integrated use of vermicompost, PM and nitrogenous fertilizers in rice. The results reveal that cowdung, compost and poultry manure and compost influenced markedly the panicle length. These results are in agreement with Singh *et al.* (2005) who found increased panicle length with the application of urea, cowdung, and Azospirillum, individually or in combinations. A significant increase in panicle length due to of organic manures and fertilizers nitrogen, sulphur, zinc and boron was also noted by Hoque (1999) and Azim (1999). Mondal *et al.* (1990) observed that the number of spikelet's panicle^{-1} of rice was increased with the increasing NPK rates and FYM application. Similar results were also reported by Chander and Pandey (1996). Razzaque (1996) noted a significant increase in grains panicle^{-1} due to application of organic manures and fertilizer nitrogen. The effect of poultry manure was more pronounced in producing filled grains panicle^{-1}. Umanah *et al.* (2003) reported that poultry manure increased the grains per panicle. Azim (1999) and Hoque (1999) noted significant increase in filled grains panicle^{-1} with the application of organic manures and fertilizers. These results are well corroborated with the findings of Rahman *et al.* (2009) who found an insignificant response of urea-N and manures on 1000-grain weight of BRRI dhan29.

Poultry manure was found more effective in producing grain yields of BRRI dhan49 as compared to the cowdung and chemical fertilizers. These results are in agreement with the findings of Rajni Rani *et al.* (2001), Rahman *et al.* (2009) and Parvez *et al.* (2008). **P**oultry manure also demonstrated superior effect in producing straw yield of rice as compared to cowdung and chemical fertilizers. Ahmed and Rahman (1991) reported that the application of organic manure and chemical fertilizers increased straw yields of rice.

It is clear that the application of organic manures had positive influences on the N uptake by BRRI dhan49. Significant increase in N uptake by rice grain and straw with the application of organic manures and fertilizers was reported by Azim (1999) and Hoque (1999). Dongarwar *et al.* (2003) observed that the P uptake by rice grain was increased with the combined application of manures and fertilizers. Rahman *et al.* (2009) also found similar results with a trial on BRRI dhan29 using urea and manures. All the treatments receiving poultry manure and cowdung significantly increased the total K uptake by rice. It was observed that the K uptake by grain was much less than that by straw. These results are well corroborated with Meena *et al.* (2003) who reported that application of organic manure and chemical fertilizers significantly increased the K uptake by rice. The S uptake by rice was also influenced significantly due to application of manures and fertilizers. These results are in agreement with Akter (2011) and Malika (2011) who found positive effects on S uptake by rice with application of manures and fertilizers.

SUMMARY

An experiment was conducted at the Soil Science Field Laboratory Khulna University (KU), Khulna during aman season of 2018 with a view to evaluating effects of manures and fertilizers for maximizing the yield of BRRI dhan48. The soil of the experimental site belongs to the 'Sonatala' series under the AEZ-9 (Old Brahmaputra Floodplain). The soil was silt loam in texture containing pH 6.18, organic matter content 2.15%, total N 0.124%, available P 6.51 ppm, exchangeable K 0.074 me/100 g soil, available S 14.85 ppm and CEC 12.5 me/100 g soil.The experiment was laid out in a Randomized Complete Block Design (RCBD) with 6 treatments and four replications. The treatments were T_0 [Control], T_1 [STB-CF (HYG)], T_2 [CD + STB-CF (HYG)], T_3 [PM + STB-CF (HYG)], T_4 [COM+ STB-CF (HYG)] and T_5 (FP). Organic
manures were applied to the plots 10 days before transplanting of rice seedlings and the manures were mixed thoroughly with the soil. The recommended doses of N, P, K and S supplied from urea, TSP, MoP and gypsum were 90, 15, 60 and 15 kg ha^{-1}, respectively. The TSP, MoP and gypsum were applied to the plots as basal during final land preparation. Urea was applied in three equal splits. Thirty five days old seedlings were carefully uprooted from a seedbed and transplanted in the experimental plots maintaining three seedlings per hill and 20 cm x 20 cm plant spacing. Intercultural operations were done for ensuring and maintaining proper growth and development of crop. At maturity, the crop was harvested. Grain and straw yields were recorded and the grain yield was expressed on 14% moisture basis while the straw yields on sundry basis. The grain and straw samples were analyzed for N, P, K and S contents. Then nutrient uptake was calculated. All the data were statistically analyzed by F-test and the mean differences were adjudged by Duncan's New Multiple Range Test (DMRT). The results of the experiment are summarized below.

Application of manures and fertilizers had a significant effect on the yield components of BRRI dhan49. The tallest plant height of 94.25 cm was found in T_3 [PM + STB-CF (HYG)]. The shortest plant of 78.88 cm was obtained in control (T_0). The maximum panicle length of 25.55 cm was recorded in T_3 [PM + STB-CF (HYG)] treatment and the lowest panicle length of 19.33 cm was recorded in the control (T_0). The number of effective tillers $hill^{-1}$ due to different treatments ranged from 9.00 to 13.50 and the minimum number was obtained in the control. The number of grains $panicle^{-1}$ ranged from 112.25 to 133.75. The treatment T_3 [PM + STB-CF

(HYG)] produced the highest number of grains $panicle^{-1}$. The lowest value was obtained in the treatment T_0 (112.25). The number of filled grains $panicle^{-1}$varied from 99.00 to 118.75. The highest number of filled grains $panicle^{-1}$was obtained in T_3 [PM + STB-CF (HYG)] treatment. The lowest number of filled grains $panicle^{-1}$ was obtained in T_0 treatment and 1000- grain weight were significantly influenced due to different treatments. It may be mentioned here that the application of organic and inorganic fertilizers showed the better performance in theyield components of rice.

The grain and straw yields of BRRI dhan49 responded significantly to the application of manures and fertilizers. The grain yield ranged from 3.61 to 4.87 t ha^{-1}. The lowest grain yield was obtained in the control (To). The highest grain yield was achieved in the treatment T_3 [PM
+ STB-CF (HYG)]. The straw yield was also significantly influenced due to combined use of manures and fertilizers. The straw yield ranged from 4.10 to 5.51 t ha^{-1} It was observed that the treatment T_3 [PM + STB-CF (HYG)] produced the highest straw yield which might be due to supply of higher amount of slow release N from poultry manure. The lowest straw yield was obtained in the treatment T_0 (control).

The NPKS contents of BRRI dhan49 varied significantly due to the addition of manures and fertilizers. The N content in rice grain and straw ranged from 1.156% to 1.294% and 0.575% to 0.678%, respectively. The treatment T_3 [PM + STB-CF (HYG)] resulted the maximum N content both in grain and straw and the minimum value was recorded in the control (To). The N content in grain was comparatively higher than that of straw. In case of grain, phosphorus content varied from 0.201% in control to 0.218% in T_2 [CD + STB-CF (HYG)]. The grain P content was higher in all the treatments than that of the straw. The treatment T_2 [CD + STB-CF (HYG)] resulted the highest phosphorus content both in grain and straw of rice. Potassium content in grain due to different treatments varied from 0.199% to 0.243%. The highest value was found in T_3 [PM + STB-CF (HYG)] treatment. The lowest value was recorded in the T_0 (control). In case of straw, potassium content ranged from 1.097% to 1.299%. It was observed that the K content in rice straw was higher than that in grain in all the treatments. In case of grain, sulphur content varied from 0.119% to 0.138%. The treatment T_3 [PM + STB-CF (HYG)] resulted the maximum N content both in grain and straw and the minimum value was recorded in the control (To). Sulphur content in grain was higher than that of straw. Organic manures influenced greatly in increasing the S content in grain and straw compared to cowdung and fertilizers.

CONCLUSIONS

From the present study it is observed that the application of manures and fertilizers showed better performance in respect of grain yield and yield contributing characters, nutrient content and nutrient uptake as compared to the application of fertilizers only. The performance of poultry manure was better than that of cowdung and compost for the growth and yield of rice. Application of poultry manure @ 3 t ha^{-1} in association with chemical fertilizers will be rewarding for the maximization of rice yield.

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