Effect of "Flora" on the Growth and Yield of Wetland Rice

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ABSTRACT

One experiment was conducted at Bangladesh Rice Research Institute farm and another experiment was conducted at farmer's field, Samantopur, Gazipur during the T. aman season, 2006 in order to determine the performance of flora on the growth and yield of wetland rice. The following four treatment combinations were tested in both site: T_1= Control (No-fertilizer), T_2= Flora @ 3ml/lit. of water, T_3= Soil Test Based (STB) dose and T_4= T_3 + Flora @ 3ml/lit. of water. BRRIdhan 31 was used as test crop. The blanket doses of fertilizers were applied on soil test based (STB). The experiments were laid out in Randomized Complete Block Design with 3 replications of each treatment. The sources of N, P, K and S were Urea, TSP, MP and gypsum. Urea was applied into three equal splits, 1/3rd basal, 1/3rd maximum tillering stage and the remaining 1/3rd at panicle initiation stage. The treatment T_4 where chemical fertilizer was applied on STB in combination with flora produced the maximum yield but in terms of economic point of view the treatment T_3 (STB) was found superior to other treatments.

Key words: Flora, growth, yield, wetland rice.

INTRODUCTION

Flora is a plant growth regulator containing 20% Nitro Benzene. It acts as a plant energizer, flowering stimulant and yield booster. The use of plant growth regulator (PGR) in rice in Bangladesh is very little. Now the requirement is to properly understand the PGR to enhance high yield and quality. Suitable PGR are necessary for sustainable agriculture that will provide maximum rice production with good quality. The performance of this flora on the growth and yield of rice was evaluated at BRRI farm and farmer's field, Samantopur, Gazipur in transplanted aman, 2006.

MATERIALS AND METHODS

Two experiments, one at Bangladesh Rice Research Institute (BRRI) farm Gazipur and the other one at farmer's field, Samantopur, Gazipur sadar were conducted during transplanted aman season, 2006. The initial soil properties of the experimental site was determined and presented in table 1. Soil texture, pH, organic matter, available P, S and Zn and exchangeable K were determined following standard methods (Black,1965; Jackson,1962; Walkley and Black,1935;

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Olsen *et al.*,1954 and Page *et al.*,1982). The following four treatment combinations were tested in both sites: T_1= Control (No-fertilizer), T_2= Flora @ 3ml/lit. of water, T_3= Soil Test Based (STB) fertilizer dose and T_4= T_3 + Flora @ 3ml/lit. of water. The experiments were laid out in a randomized complete block design with three replications having unit plot size of 5m x 4m. Fertilizer doses on STB were 93 kg N, 16 kg P, 38 kg K and 10 kg S/ha for BRRI farm and 73 kg N, 14 kg P, 43 kg K and 12 kg S/ha for Farmers' field and was applied as urea, TSP, MP and gypsum, respectively. BRRIdhan 31 was used as the test crop. Thirty-day old 2-3 seedlings/hill were transplanted with 20 cm x 20 cm spacing. TSP, MP and Gypsum were applied at final land preparation. Urea was applied in three equal splits, 1/3 as basal, 1/3rd at maximum tillering stage and the remaining 1/3rd at panicle initiation stage. The plant growth regulator (PGR) flora was sprayed on the rice plant at 4 different growth stages. The detail spray schedule is presented in table 2. Necessary intercultural operations were done as and when required. At maturity, the crop was harvested from 5 m^2 area at the centre of each plot. The plant height, tiller and panicle production and grain and straw yield were recorded. The grain yield was adjusted to 14% moisture content. Recorded data on yield and yield components were statistically analyzed using "Analysis of Variance" technique and mean differences were adjudged with Least Significant Difference (LSD) test. Finally economic analyses were done to identify the most economically viable treatment.

Table 1. Initial Soil Characteristics of the Experimental Site of Flora, T. Aman 2006

Parameters	Value	
	BRRI farm, Gazipur	Farmers Field, Gazipur
Texture	Clay- loam	Clay- loam
pH(1:2.5)	6.20	5.42
Total N (%)	0.08 (Very low)	0.14 (low)
Available P(ppm)	8.6 (low)	10.19 (low)
Exchangeable K(meq/100g soil)	0.14 (low)	0.12 (low)
Available S (ppm)	14 (low)	9.5 (low)
Available Zn(ppm)	2.66 (very high)	3.03 (very high)

Table 2. The application time and rate of flora in rice

Spray schedule	Spray time	Spray volume
First spray	7 days before transplanting	10 lit. for the required nursery
Second spray	25 days after transplanting	100 lit./ha
Third spray	50 days after transplanting	160 lit./ha
Fourth spray	75 days after transplanting	160 lit./ha

RESULTS AND DISCUSSION

Growth and Yield

BRRI Farm, Gazipur

Application of flora or chemical fertilizer either alone or in combination increased the plant height, tiller and panicle production and 1000-grain weight and decreased the sterility percentage of grain than that of control plot (Table 3). The highest plant height, tiller and panicle production and the lowest sterility percentage was observed in treatment T_4 (STB + Flora @ 3ml/lit. of water) followed by treatment T_3 (STB). Application of inorganic fertilizer or flora either alone or in combination increased the grain and straw yield of rice over control. Application of flora alone increased the grain and straw yield over control and STB fertilization further increased the yield over flora treated plot. The grain and straw yields were further increased but not significantly with the combined application of inorganic fertilization STB and flora. The results indicated that the application of flora alone significantly increased the grain yield over control but in combination with chemical fertilizer on STB did not significantly influenced the grain yield. The increased panicle production per unit

area, increased 1000 grain weight and decreased sterility percentage with the application of flora or STB fertilization either alone or in combination may support the increased grain and straw yield.

Table 3.   Effect of Flora alone and in combination with chemical fertilizer on the growth and yield of wetland rice, BRRI, Gazipur, T. Aman, 2006

Treatment*	Plant height (cm)	Tiller No./m²	Panicle No./m²	% Sterility	1000- grain weight (g)	Grain yield (t/ha)	Straw yield (t/ha)
T1	105	159	140	30	23.4	2.83	3.87
T2	114	175	163	28	24.3	3.33	4.53
T3	122	202	187	28	24.5	4.22	5.72
T4	125	211	190	27	24.5	4.48	5.81
LSD (5%)	6.8	10	12.8	5	2	0.39	0.25

Farmer's Field, Samantopur, Gazipur

Application of flora or chemical fertilizer on STB alone or in combination increased the plant height, tiller and panicle number of rice over control. The highest plant height and maximum number of tillers and panicles were recorded in treatment T_4 (STB + Flora @ 3ml/lit. of water) followed by treatment T_3 (STB) (Table 4). On the other hand, application of Flora alone or chemical fertilizer on STB alone or in combination with flora increased the grain and straw yields of rice over control. The treatment T_4 produced the maximum grain and straw yields followed by the treatment T_3. From the results it appears that alike BRRI farm, Gazipur the application of flora alone statistically increased the grain yield over control but in combination with chemical fertilizer did not significantly increased the grain yield over STB.

Table 4.   Effect of Flora alone and in combination with chemical fertilizer on the growth and yield of wetland rice, Samantopur, Gazipur, T. Aman, 2006

Treatment*	Plant height (cm)	Tiller No./m²	Panicle No./m²	%Sterility	1000- grain weight (g)	Grain yield (t/ha	Straw yield (t/ha)
T1	120	230	215	31	24.4	2.67	3.75
T2	121	251	242	27	24.3	3.22	4.47
T3	124	278	263	29	24.1	4.24	5.46
T4	125	283	272	26	24.5	4.50	5.62
LSD (5%)	0.99	16	12	2	2	0.32	0.58

* T_1= Control (No-fertilizer), T_2= Flora @ 3ml/lit. of water, T_3= STB and T_4= T_3 + Flora @ 3ml/lit. of water

Economic analysis

Net benefit

Economic analysis on partial budget of the experiment is presented in Table 5 and 6. The net benefit of each treatment is calculated by subtracting the total costs that vary from the gross field benefit. The total costs that vary are the sum of all the costs that vary for a particular treatment. The maximum net benefit was achieved in treatment T_4 followed by T_3 in both the experimental sites.

Dominance and marginal analysis

The analysis has been done in stepwise manner, passing from the treatment with the lowest costs that vary to the next considering. As the increase in cost, the net benefit would be increased.

It is well known that the minimum marginal rate of return for the crop is 100%. If the marginal rate of return of the change from the first to the second treatment is equal or above the minimum marginal rate of return then the next comparison has been made between second and third treatment (not between first and third). This comparison has been continued (i.e. increasing level of investment) until the marginal rate of return falls below the minimum rate of return.

Table 5. Economic analysis of "Flora" in wetland rice BRRI, Gazipur, T. Aman, 2006

a) Total variable cost (TVC) in Tk./ha

Treatment	Fertilizer cost*	Fertilizer application cost	Flora spraying cost	Labor cost for additional product	TVC
T1	0	0	0	0	0
T2	387	0	560	140	1087
T3	4010	280	0	389	4679
T4	4397	280	560	462	5699

* Total fertilizer cost included chemical fertilizer and flora.
Urea = Tk. 6.00 /kg, TSP= Tk 18.00/kg, MP= Tk.14.00./kg , Gypsum= Tk. 5.00/kg, Flora= Tk. 300 /lit.
Labor wage= Tk.140/day, Two additional man days/ha are required for applying fertilizer, two man days/ha for per ton additional products including byproducts and four man days/ha for spraying flora.

b) Net benefit in Tk./ha

Particulars	Treatments			
	T_1	T_2	T_3	T_4
Grain yield (t/ha)	2.83	3.33	4.22	4.48
Straw yield (t/ha)	3.87	4.53	5.72	5.81
Gross field benefit, grain (Tk/ha)	28300	33300	42200	44800
Gross field benefit, straw (Tk/ha)	7740	9060	11440	11620
Total gross field benefit (Tk/ha)	36040	42360	53640	56420
Total gross field cost (Tk/ha)	0	1087	4679	5699
Net benefit (Tk/ha)	36040	41273	48961	50721

Paddy= Tk.10.00/kg and straw= Tk. 2.00 /kg

Table 6. Economic analysis of "Flora" in wetland rice at farmer's field Samantopur, Gazipur, T. Aman, 2006

a) Total variable cost (TVC) in Tk./ha

Treatment	Fertilizer cost*	Fertilizer application cost	Flora spraying cost	Labor cost for additional product	TVC
T1	0	0	0	0	0
T2	387	0	560	154	1101
T3	3761	280	0	440	4481
T4	4148	280	560	512	5500

*Total fertilizer cost included chemical fertilizer and flora.
Urea = Tk. 6.00 /kg, TSP= Tk 18.00/kg, MP= Tk.14.00./kg , Gypsum= Tk. 5.00/kg, Flora= Tk. 300 /lit.
Labor wage= Tk.140/day, Two additional man days/ha are required for applying fertilizer, two man days/ha for per ton additional products including byproducts and four man days/ha for spraying flora.

b) Net benefit in Tk./ha

Particulars	Treatments			
	T_1	T_2	T_3	T_4
Grain yield (t/ha)	2.67	3.22	4.24	4.5
Straw yield (t/ha)	3.75	4.47	5.46	5.62
Gross field benefit, grain (Tk/ha)	26700	32200	42400	45000
Gross field benefit, straw (Tk/ha)	7500	8940	10920	11240
Total gross field benefit (Tk/ha)	34200	41140	53320	56240
Total gross field cost (Tk/ha)	0	1101	4481	5500
Net benefit (Tk/ha)	34200	40039	48839	50740

Paddy= Tk.10.00/kg and straw= Tk. 2.00 /kg

The maximum marginal rate of return was obtained with treatment T_3 (both sites). Farmers will continue to invest as long as the returns to each extra unit invested (measured by MRR) which are higher than the cost of the extra invested (measured by the minimum acceptable rate of return) (Table 7 and 8). Thus it can be concluded that T_3 (both sites) is the most economically viable treatment of the experiment.

Table 7. Dominance and marginal analysis of "Flora" for rice production, BRRI, Gazipur, T. aman 2006

Treatments*	Total costs that vary (Tk./ha)	Net benefit (Tk./ha)	Marginal rate of return (%)
T1	0	36040	
T2	1087	41273	
T3	4679	48961	214
T4	5699	50721	173

Table 8. Dominance and marginal analysis of "Flora" for rice production, at farmer's field Samatopur, Gazipur, T. aman 2006

Treatments*	Total costs that vary (Tk./ha)	Net benefit (Tk./ha)	Marginal rate of return (%)
T1	0	34200	
T2	1101	40039	
T3	4481	48839	260
T4	5500	50740	187

* T_1= Control (No-fertilizer), T_2= Flora @ 3ml/lit. of water, T_3= STB and T_4= T_3 + Flora @ 3ml/lit. of water

CONCLUSIONS

The treatment T_4 where chemical fertilizer was applied on STB in combination with flora produced the maximum yield but in terms of economic point of view the treatment T_3 (STB) was found superior.

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