

EFFECT OF BIOFERTILIZERS AND CROP RESIDUE FOR SUSTAINABLE RICE (*ORYZA SATIVA* L.) PRODUCTION IN MANIPUR

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ABSTRACT

During *kharif* (rainy) season of 1995-1999 an experiment was conducted at ICAR Research Complex Farm, Imphal, Manipur to optimise the use of chemical fertilizer with crop residue and bio-fertilizer as a supplementary source of nutrients. Azospirillum and Phosphatica increased the grain yield of rice by 15.21% and 12.22%, respectively, Azospirillum and Phosphatica when used together increased rice yield by 18.43% and Azospirillum and Phosphatica along with full dose of NPK (60-40-30 Kg/ha) and half dose of NPK (30-20-15 Kg/ha) significantly increased the rice yield by 52.39% and 34.23% respectively over control. Interestingly minimum incident of neck blast was observed in the plots received full dose of chemical fertilizer and Azospirillum + Phosphatica.

INTRODUCTION

Rice, being the staple food, rice based agriculture and allied activities are the single largest source of livelihood of the majority people of Manipur. Out of total cultivable area of about 2.10 lakhs ha in the state, the area under main rice crop during *kharif* is 1.90 lakhs ha, which is about 93.00% of the net cultivable area. About 15000 ha rice is grown as a *pre-kharif* under irrigated wetland system. Rice is largely cultivated by small and marginal farmers. Area, production and productivity of rice in the state for the years 1996-97 – 1988-99 and estimated population along with rice requirement for the years 1998-99 – 2000-01 are presented in Table 1 and 2, respectively. A study of the sectorial contribution of the State Domestic Product (SDP) which is commonly known as "State Income" of Manipur shows that the contribution of the agricultural sector with rice being predominant contributes about 53.0% of the total SDP (Singh and Baghel, 2000).

Among the North Eastern states, Manipur ranks first in fertilizer consumption per unit area (66 Kg/ha). But the consumption ratio of N:P: K which is 24.4: 9.6: 1.0 against the recommended dose of 60:40:30 Kg/ha (2.0 : 1.3: 1.0) is highly unbalanced and injudicious for rice cultivation in Manipur (Kumar and Ray Chowdhury,

2000). The use of chemical fertilizer in adequate quantities is, perhaps, the fastest way of increasing the production and arresting the depletion of soil nutrients. However, the resource poor farmers are not able to use the recommended quantities and in balance proportion. This problem can be solved to a considerable extent by using available resources like crop residue, biofertilizer and organic manure. Keeping this point of view the present experiment was carried out.

MATERIALS AND METHODS

The field experiment was carried out at ICAR Res. Complex for NEH Region Lamphelpat, Imphal during kharif season of 1995-99 in a randomised block design with three replications. The twelve treatments (T_1 -Control; T_2 -NPK(60:40:30); T_3 -Azospirillum + Phosphatica; T_4 - Paddy straw incorporation in soil, T_5 - T_2 + T_3 , T_6 - T_2 , T_7 - NPK (30: 20:15); T_8 - T_7 + T_3 ; T_9 - T_7 + T_4 ; T_{10} - Azospirillum, T_{11} -Phosphatica and T_{12} - T_3 + K(30 Kg/ha) were compared. The soil of the experimental field was clay having pH 5.0-5.4, organic carbon content range from 1.5-4.0, available N and K status is medium while deficient in P availability. The rice variety KD2-6-3 was transplanted with the spacing of 20x15 cm. According to treatments fertilizers were applied through urea, SSP and MOP. Crop was weeded twice. Other required practices like plant protection etc. followed in all the treatments equally as and when required.

RESULTS AND DISCUSSION :

The grain yield of rice differed significantly. Azospirillum and Phosphatica increased the grain yield by 15.21% and 12.22%, respectively over control (30.12 q/ha). Ramkrishna *et al.* (1992) also found that Azospirillum increased yield by 13.20%. Azospirillum and Phosphatica when used together increased rice yield by 18.43% over control. However, paddy straw incorporated treatment increased yield by 16.87% over control. Azospirillum and Phosphatica along with full dose of NPK (60-40-30 Kg/ha) and half dose of NPK (30-20-15 Kg/ha) significantly increased the yield by 52.39% and 34.23%, respectively over control. Paddy straw incorporation in soil along with full dose and half dose of NPK also significantly increased the yield by 44.89% and 31.37%, respectively over control. However, Azospirillum + Phosphatica along with K(30 kg/ha) significantly increased the rice yield by 22.34% over control. In all the treatments neck blast infestation was observed with highest percent of 59.28 in T_2 followed by 56.70% in T_1 and 55.33% in T_7 . Interestingly minimum incidence of 30% was observed in the plot received full dose of chemical fertilizer and Azospirillum + Phosphatica. Leaf blast incidence was less but development of neck blast was prominent two weeks before harvest.

The increase in rice yield may be due to improving the nutrients supply and their continuous availability to the crop through microbial activities of Azospirillum and Phosphatica. Rice straw incorporation had an important role in improving the continuous nutrients supply and their availability to the crops.

It can be concluded that for resource poor farmers, application of half dose (30-20-15 N-P-K Kg/ha) along with either Azospirillum + Phosphatica or incorporation of paddy straw (crop residue) may be recommended for increased yield of rice under Manipur condition.

REFERENCES

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Table 2. Projected population and rice requirement of Manipur

(As on March, 2001)

Year	Population	Rice requirement (tonnes)
1998-99	22,13,104	4,54,512
1999-2000	22,62,477	4,64,652
2000-2001	23,12,331	4,74,890

Table 3. Effect of bio-fertilizer, crop residues and N,P,K on grain yield and neck blast incidence of rice. (Pooled data of 6 years)

Treatments	Grain yield (q/ha)	% increase in yield over control	% neck blast incidence
T1-Control	30.12	-	56.70
T2-NPK (60:40:30 Kg/ha)	42.78	342.03	49.28
T3-(Azospirillum + Phosphatica)	35.67	18.43	51.23
T4-Rice straw incorporation (5 t/ha)	35.20	16.87	43.29
T5-T2+T3	45.93	52.39	30.00
T6-T2+T3	45.93	52.39	30.00
T6-T2+T4	43.64	44.89	43.60
T7-NPK (30:20:15 Kg/ha)	34.57	18.10	55.33
T8-T7+T3	40.43	34.23	48.29
T9-T7+T4	39.57	31.37	45.60
T10-Azospirillum	34.70	15.21	52.34
T11-Phosphatica	33.80	12.22	48.65
T12-T2+K (30 Kg/ha)	36.85	22.34	39.51
CD (0.05)	5.06	-	-

Table 1 Area, production and productivity of rice in Manipur

Type of cultivation	1996-97			1997-98			1998-99		
	Area (000 ha)	Production (000 t)	Productivity (k g/ha)	Area (000 ha)	Production (000 t)	Productivity (Kg/ha)	Area (000 ha)	Production (000 t)	Productivity (Kg/ha)
Irrigated wet land (pre kharif rice)	14.94	29.88	2000	13.72	30.19	2200	16.50	42.00	2545
Rain fed wet land (local variety)	29.28	42.99	1468	29.28	40.99	1400	28.59	1377	
Rainfed wet land (HYV)	72.00	220.05	3056	72.00	219.25	3045	73.00	222.07	3038
Jhoom Cultivation (Local var)	83.72	80.53	962	83.72	79.53	950	83.71	80.00	956
Rainfed terrace Cultivation	10.00	13.00	1300	10.00	12.00	12.00	10.00	14.00	1400
Total	209.94	386.45	-	208.72	381.96	-	211.96	397.66	-