



Productivity Enhancement of Organically Grown Local Scented Rice- Wheat Cropping Sequence due to Enriched Compost Application

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ABSTRACT

The organic farming in hilly areas of Uttarakhand is default by nature as chemical fertilizer and use of fungicide, insecticide and herbicide is negligible. In hilly regions of district Pithoragarh rice wheat is an important cropping sequence. The entire scented rice in the district is grown organically and the yield of local scented rice varieties is very low. The present study was conducted by Krishi Vigyan Kendra Pithoragarh to compare the farmers' practice (T-1) with two treatments viz; T-2: 20 t FYM to Rice and Wheat along with phosphorus solubilising bacteria (PSB) and T-3: 20 t FYM to Rice and Wheat along with PSB, Azotobacter and Azospirillum. The experiment was conducted at farmers' field in two villages viz; Bagrihat and Egyardevi. In village Bagrihat during 2007 treatment T-3 resulted in 13.7 and 11.7 per cent increase in yield of rice and wheat over farmers' practice respectively. While in village Egyardevi treatment T-3 resulted in higher yield of rice and wheat during both the years of study. Net return for treatment T-3 was higher as compared to treatment T-1 and T-2. Thus application of well decomposed F.Y.M enriched with Azotobacter, Azospirillum and PSB resulted in higher yield of scented rice and wheat cropping sequence over traditional farmers' practice.

Key Words: Organic Farming, Scented Rice, Wheat, Cropping Sequence.

INTRODUCTION

Organic agriculture is a production system which avoids or largely excludes the use of synthetic compounded fertilizers, pesticides, growth regulators and livestock feed additives. It takes an ecological approach to nutrient supply and crop production rather than chemical one. Nutrient supply to crops under organic cultivation are mainly dependent on organic sources of nitrogen such as legumes, manures, composts, bio-fertilizers and crop rotations. The primary goal of organic agriculture is to optimize the health and productivity of inter-dependent communities of soil life, plant, animals and people. When soil is in good health the population of soil fauna and flora multiplies rapidly which in turn sustains the bio-chemical process of dissolution and synthesis at higher rate. Under it emphasis is paid to promotion of varieties that are better adapted to local biotic condition.

State of Uttarakhand and Sikkim have declared themselves as organic state. In hilly areas of the State of Uttarakhand fertilizer, pesticide and chemical fertilizer application is negligible. The current use of chemical fertilizer is less than 7 kg/ha/year and that of pesticide is negligible. The cultivation practiced is largely organic in nature, largely due to non-availability and lack of knowledge of chemical fertilizer use in remote hilly areas of state. In the district Pithoragarh local scented rice is preferred by farmers for their own consumption. The yield of local scented varieties is low, due to lack of proper nutrient application. In wheat crop also wide spread nitrogen deficiency is observed in the district due to low temperature and lack of nutrient supply. The present study was, therefore, taken to enhance the nutrient supply of the traditionally grown scented rice varieties and wheat crop and compare the yields to the traditional cultivation practice.

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MATERIALS AND METHODS

The experiment was conducted at farmers' field in Pithoragarh district of Uttarakhand. Two villages namely Egyardevi and Bagrihat were selected as in these villages organic farming was promoted from 2002-03 by State Department of Agriculture. Village Egyardevi is located at an altitude of 1600m above mean sea level, aspect of slope was north facing for the village, the average initial organic carbon level of the village was 1.98 per cent and mean pH was 6.96. The village Bagrihat is located at an altitude of 1200m above mean sea level in the valley region. The average initial organic carbon level of the village was 1.06 per cent and mean pH was 6.22. The experiment was conducted in 2006-07 and 2007-08 in both the villages. Experiment was conducted on 6 farmers' field in village Bagrihat and on 5 farmers' field in village Egyardevi. All the selected farmers had 2-3 livestock so that enriched manure could be generated. The different treatments used were as under:

T-1: Farmer's practice.

T-2 : 20 t/ha FYM to rice and 20 t/ha FYM to wheat + PSB

T-2: 20 t/ha FYM to rice+ Azotobacter + Azospirillum and 20 t/ha FYM to wheat + Azotobacter + Azospirillum+ PSB.

Enrichment of compost was done by PSB, azotobacter and azospirillum during composting. Sowing of rice nursery was done on 1st May during both the years, for it sprouted seeds were sown. The local basmati variety whose aroma is preferred by the farmers was grown. 35 d old rice seedlings were transplanted with the spacing of 15x15 cm . Sowing of wheat was done on 16th of October in 2006 and on 14th of October in 2007 and harvesting of wheat was done from 15 to 20 April in village Bagrihat and from 5th to 10th May in Village Egyardevi. In rice crop local scented varieties were grown while in wheat crop variety VL-616 was grown. Plant growth parameters like plant height, number of tillers were recorded, and seed yield is expressed at 14 per cent moisture level. Following plant protection measures were practiced to control weeds, insects and diseases in both the villages.

i). To control weeds two hand weeding were

done, first at 30 d after transplanting and second after 55 d after transplanting in rice and in wheat two hand weeding at 35 and 65 d after sowing was done.

- ii). To control insect pests in rice crop 20 Pheromone traps per hectare at an distance of 20x 25 m were placed after one week of transplanting for control of stem borer, and the lure was replaced after 30 d. The height of trap was maintained at 30 cm above crop canopy. In wheat no occurrence of insect pest was observed.
- iii). In rice crop spraying of mixed formulation of compatible strains of *Pseudomonas fluorescence*+ *Trichoderma harzianum* @ 5 g/l at panicle initiation for control of sheath blight, sheath rot, and neck blast was done. Three sprays were done at 10 d interval. In wheat crop no measures were taken as there was no occurrence of insect and diseases.

RESULTS AND DISCUSSION

Farmers' Practice

Farmers of the village Bagrihat grow rice with the average FYM application of 10 t/ha., while in the village Egyardevi the average use of FYM was 8 t/ha. Bio-fertilizer was not used in both the villages in both crops. In wheat crop FYM application rate was 8 t/ha in both the villages. No chemical fertilizer was applied and no insect and pest control measures were followed in both the villages.

Soil Properties

The pH range of soils of village Bagrihat was acidic in nature, while that of village Egyardevi it was acidic to neutral. The organic carbon per cent in soil of both the villages was in high range but due to prevailing cold temperature its mineralization was influenced. Wide spread deficiencies of nitrogen were visible in wheat crop from December to February due to slow mineralization. Available potassium in soil was also in high range in both the villages. There was very minimal change in soil properties after two years of experimentations (Table 1).

Rice Yield

Rice crop in village Bagrihat was taken under

Enriched Compost Application in Rice Wheat Cropping Sequence

Table-1: Initial and final soil properties of villages Bagrihat and Egyardevi.

Soil Parameters	Village Bagrihat				Village Egyardevi			
	Initial Value		Final Value		Initial Value		Final Value	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
pH	6.22	5.68-6.52	6.22	5.67-6.51	6.96	6.75-7.09	6.95	6.75-7.06
EC (ds/m)	0.03	0.002-0.05	0.03	0.002-0.05	0.06	0.05-0.08	0.06	0.05-0.08
Organic Carbon (%)	1.06	0.36-1.56	1.08	0.40-1.60	1.98	1.83-2.15	1.95	1.73-2.10
Available K (Kg/ha)	253.12	196.0-288.94	250.1	192.0-283.4	285.6	241.9-369.6	283.7	238.9-366.7

rained condition during 2006 as the cemented irrigation channel was damaged, while during 2007 it was grown under irrigated condition. In village Egyardevi rice crop was grown in restricted irrigation condition, irrigation was provided only when rain water scarcity was there. Mean plant height in village Bagrihat was 120.8cm and 140.7cm during year 2006 and 2007, respectively (Table 2). The number of tillers/hill were also higher in 2007 as compared to year 2006. The mean grain yield of local scented rice in village Bagrihat was higher in 2007 as compared to 2006. Among the treatments, T-3 recorded highest grain yield in both the years and it was 7.3 and 13.7 per cent higher than farmers' practice in 2006 and 2007 respectively. Similarly, in village Egyardevi higher plant height, number of tillers and grain yield was recorded with treatment T-3 during both the years (Table 2). Treatment T-3 recorded 5.7 and 14.9 per cent higher yield over treatment T-1 during 2006 and 2007 respectively. Similar findings under organic practices were also reported by Mahapatra *et al* (2006).

Wheat Yield

Wheat crop in both the villages was grown under rainfed condition as the irrigation in both the villages is dependent on natural springs and these dry up in winter and summer months. In village Bagrihat higher plant height and number

of tillers were recorded in treatment T-3 as compared to T-2 and T-1 (Table 3). Higher grain yield was also recorded under treatment T-3 and it was 16.7 and 11.7 per cent higher over farmers' practice (T-1) during 2006 and 2007, respectively. In village Egyardevi higher plant height, number of tillers and grain yield was recorded under treatment T-3 as compared to T-2 and T-1 (Table 3). The wheat grain yield under treatment T-3 was 17.4 and 17.3 per cent higher over treatment T-1 during 2006 and 2007, respectively. Application of well decomposed enriched FYM helped in higher nutrient availability and results higher grain yield of wheat crop. The results were in conformity with the findings of Patro *et al* (2005).

CONCLUSION

In the view of the results obtained in this study it may be concluded that inoculation of FYM with biofertilizers holds promise for organic farming of scented rice and wheat.

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Table 2. Growth, yield attributes and yield of rice as influenced by various organic treatments.

Treatments	Village- Bagrihat						Village-Egyardevi					
	Plant height at harvest (cm)		Number of tillers/hill at harvest		Grain yield (q/ha)		Plant height at harvest (cm)		Number of tillers/hill at harvest		Grain yield (q/ha)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
T-1	117.8	137.3	3.0	5.5	17.8	27.8	113.0	119.5	3.0	3.8	17.6	19.5
T-2	121.3	140.5	3.5	6.7	18.4	29.5	115.6	124.2	3.0	4.6	18.1	21.2
T-3	123.3	144.2	3.8	7.2	19.1	31.6	119.0	126.4	3.4	5.2	18.6	22.4

Kumar and Mahapatra

Table-3 : Growth, yield attributes and yield of wheat as influenced by various organic treatments.

Treatments	Village- Bagrihat						Village-Egyardevi					
	Plant height at harvest (cm)		Number of tillers/ hill at harvest		Grain yield (q/ha)		Plant height at harvest (cm)		Number of tillers/ hill at harvest		Grain yield (q/ha)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
T-1	99.2	104.0	3.0	3.6	14.4	16.3	99.2	98.0	2.7	2.1	13.8	12.7
T-2	102.7	109.0	3.3	3.8	15.3	17.5	102.4	102.0	3.0	2.4	15.1	14.2
T-3	105.0	113.0	3.5	4.1	16.8	18.2	105.0	105.0	3.3	2.7	16.2	14.9
Mean	102.2	109.0	3.3	3.8	15.5	17.3	101.9	102.0	3.0	2.4	15.0	13.9

REFERENCES

Mahapatra B S, Misra A, Chilana K, Kumar A and Singh S P (2006). Growth and yield of basmati rice under organic mode during initial years of conversion in relation to nutrient management practices. *Journal of Eco-friendly Agriculture* 1:1-5.

Patro H K, Mahapatra B S, Bhushan C, Kumar A, Singh S P and Chilana K (2005). Effect of organic sources and nitrogen levels on dry matter production and uptake of major nutrients under Rice-Wheat cropping system. *Pantnagar Journal of Research* 3(1):9-16

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