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Effect of liquid biofertilizers on yield and economics of rice

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Abstract

Effect of liquid biofertilizers on yield and economics of rice was assessed in fields of prakasam dt during *Kharif*, 2016-17 and 2017-18 in 2.4 ha each year by Krishi Vigyan Kendra, Darsi, Prakasam dt of Andhra Pradesh. In demoplot crop was supplied with 500 ml of Azospirillum and 500 ml of PSB along with 50% recommended dose of fertilizers. In control plot crop was solely supplied with 100% recommended dose of fertilizers. The results indicated that application of biofertilizers improved yield and C: B ratio of rice. Demo plot recoded the average yield of 62.9 q ha⁻¹ with B: C ration of 2.01. Whereas, control plot pooled recorded average yield of 59 q ha⁻¹ with B: C ratio of 1.7.

Keywords: Paddy, biofertilizers, *azospirillum*, *phosphorus solubilizing bacteria*, yield, economics

Introduction

Rice is one of the most important food crops and feeds more than 60 per cent population of India. India is one of the world's largest producers of rice and brown rice, accounting for 20% of all world rice production. In rice, farmers are using fertilizers indiscriminately in order to get higher yields which lead to soil health deterioration, water and environmental pollution and also increase cultivation cost. With the usage of chemical fertilizers soil fertility is also being reduced which makes the crop very difficult to grow. Bio-fertilizers contains bacteria which increases organic carbon and nutrient status in soil which lead to increase in soil fertility. Bio-fertilizers are becoming increasingly popular in many countries and for many crops. They are defined as products containing active or latent strains of soil microorganisms, either bacteria alone or in combination with algae or fungi that increase the plant availability and uptake of mineral nutrients (Vessey, 2003) [2]. In order to increase the nutrient status in soil and to reduce cost of cultivation this on farm trial was conducted in farmers' fields.

Materials and Methods

1. Place of study: Pulipadu and Reddynagar (Mundlamuru mandal)-2016-17, Chintalapalem and Pulipadu (Darsi mandal)-2017-18
2. Area: 2.4 ha during each year
3. No. of farmers: 6 during each year
4. Design: On farm trials in farmers' fields
5. Variety: NLR 34449
6. Treatments

T1: Application of biofertilizers through seedling dip method (500 ml *Azospirillum* + 500 ml Phosphobacterium) + 50% RDF

Procedure: In the corner of the field 70 litres of water were filled in a pit. In the water 500 ml of *Azospirillum* and PSB were added. Before transplanting the seedlings of paddy were dipped in the biofertilizers added water for 10 min and then used for transplanting.

T2: Farmers practice (100% RDF without biofertilizers)

7. Data recorded

1. Yield
2. Economics

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Economics was calculated as shown below

Cost of cultivation (Rs. ha⁻¹)

Cost of cultivation (₹ ha⁻¹) was calculated considering the prevailing charges of agricultural Operations and market price of inputs involved.

Gross returns (Rs. ha⁻¹)

Gross returns were obtained by converting the harvest into monetary terms at the prevailing market rate during the course of studies.

Gross return (₹ ha⁻¹) = (Seed yield x price)

Net returns (Rs. ha⁻¹)

Net returns were obtained by deducting cost of cultivation from gross return.

Net returns (₹ ha⁻¹) = Gross return (₹ ha⁻¹) - Cost of cultivation (₹ ha⁻¹)

Cost: benefit ratio

The benefit: cost ratio was calculated by dividing gross returns by cost of cultivation.

$$\text{Cost: benefit ratio} = \frac{\text{Gross returns (₹ ha}^{-1}\text{)}}{\text{cost of cultivation (₹ ha}^{-1}\text{)}}$$

Results and Discussion

Yield: Data presented in the table 1 revealed that demo plots recorded higher yields compared to control plots. In demo plots mean yield recorded was 62.9 q ha⁻¹. Per cent increase in yield in demo plot over control was 6.7. Even though in demo plot, yield was not significantly higher than control plot but cost of cultivation was reduced in demo plots. Whereas, in control plot yields were less compared to demo plots with mean of 59q ha⁻¹. Higher yield in demo plots were due to increased availability of nitrogen and phosphorus as Azospirillum, a nitrogen fixing bacteria fixed the atmospheric nitrogen and made it available to crop. PSB which is a phosphorus solubilizer converted the unavailable form of phosphorus into available form and made it available to plants. Banayo *et al.*, 2012 [1] also reported that use of bio-fertilizers showed higher yields compared to chemical fertilizers alone.

Economics: Gross returns and B: C ratio were substantially higher under demo plot compared to control plot (Table 1). Higher mean gross returns of 104167 Rs ha⁻¹ and net returns of 52250 Rs ha⁻¹ were obtained in demo plot with B: C ratio of 2.01. In control plot, mean gross returns were 98225 Rs ha⁻¹ and net returns were 40975 Rs ha⁻¹. Mean B: C ratio in control plot was 1.7. Higher gross returns and B: C ratio in demo plot compared to control plot was due to higher yield.

Table 1: Yield and economics of cotton with and without micronutrients

Particulars	Demo			Control		
	2016-17	2017-18	Pooled mean	2016-17	2017-18	Pooled mean
Yield (q ha ⁻¹)	63	62.7	62.9	57	61	59
Per cent increase in yield over control	10.5	2.8				
Cost of cultivation (Rs ha ⁻¹)	52000	51833	51917	57500	57000	57250
Gross returns (Rs ha ⁻¹)	92400	115933	104167	83600	112850	98225
Net returns (Rs ha ⁻¹)	40400	64100	52250	26100	55850	40975
B :C Ratio	1.77	2.24	2.01	1.45	1.98	1.7

Conclusion

Biofertilizers improves the quality of the produce. Using the chemical fertilizers alone deteriorated soil and crop quality and also increased cost of cultivation. Application of biofertilizers and reducing chemical fertilizers in turn reduced cultivation cost and increased income per rupee invested.

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