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Response of rice varieties to integrated nutrient management practices on yield nutrient uptake and economics of rice

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Abstract

A field experiment was conducted during *kharif* 2010 at Directorate of Rice Research Farm, Rajendranagar Hyderabad. Three varieties (Vasumathi, Tulasi, and RP-BIO-226) and six nutrient management practices (control, 100% vermicompost, 75% vermicompost+ 25% RDF, 50% vermicompost+ 50% RDF, 25% vermicompost+75% RDF and 100% RDF) were evaluated in split plot design with three replications.

Variety RP-BIO-226 performed better in terms of growth and yield components resulting in significantly higher grain yield (4536 kg/ha) over Tulasi (4138 kg/ha) and Vasumathi (3248 kg/ha). Nutrient uptake was also significantly greater with RP-BIO-226 than Tulasi and Vasumathi. Among the different nutrient management practices treatment 50% organic manure (Vermicompost) + 50% rdf recorded significantly higher grain yield (5010 kg/ ha) over the all the treatments. Economics analysis clearly shown that scented variety vasumathi out weighed the RP –BIO –226 Interm of gross returns, net returns and B-C ratio under 100% RDF followed by 25% vermicompost + 75% RDF and 50% vermicompost + 50% RDF.

Keywords: varieties, economics, uptake, nutrient management practices

Introduction

Rice the staple cereal food grain of majority of India s over one billion population, contributes to nearly 44% of total food grain production. In India rice is grown over an area of 44 m ha with a total production being 99 mt and productivity of 2214 kg/ha (CMIE, 2009) [3]. In Andhra Pradesh, the area under rice is 4 m ha with 14 mt of production and the productivity being 3248 kg/ha. The projected target of 100 million tonnes by 2010 (Mishra, 2004) may not be a daunting task unless productivity is enhanced to strengthen the food security act of India.

One of the approaches to increase per hectare yield is by selecting suitable varieties combining them with good crop husbandry practices especially nutrient management. System of rice intensification (SRI) is a system approach to enhance rice productivity with less external inputs which gained momentum in India in recent past. Integrated nutrient management is one of the ways for sustainable rice production in India. Fertilizer application is the major input through which the productivity can be increased by exploiting the varietal potential, since the cost of inputs of major nutrients through chemical fertilizers is increasing and the inherent fertility of soil has to be increased to make the soil more sustainable, the use of organic manure in manurial schedules is suggested. Hence, integrated nutrient management is more emphasized, not only to boost the production but also to preserve the ecosystem.

Materials and Methods

A field experiment was conducted at directorate of rice research farm, Rajendranagar, Hyderabad during the Kharif season of 2010. The soil of the experimental site was vertisols in texture with low nitrogen, high phosphorous and potassium with alkaline reaction. The experiment was laid out in a split plot design replicated thrice with three varieties and 6 nutrient management practices

Sub- plot treatments: 6

1. Control (No fertilizer)
2. 100% organic manure (Vermicompost)
3. 25% RDF through inorganic fertilizer+75% organic manure (Vermicompost)
4. 50% RDF through inorganic fertilizer+50% organic manure (Vermicompost)
5. 75% RDF through inorganic fertilizer+25% organic manure (Vermicompost)
6. 100% RDF through inorganic fertilizer

RDF = Recommended dose of fertilizer (100:60:40) kg/ha NP and

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Transplanted by adopting 25 x 25 cm spacing vermicompost 5t/ ha (100% organic) used as organic manure was applied as per the treatments after field layout and incorporate urea, ssp, murate of potash used as chemical fertilizers.

Results and Discussion

Higher dry matter production observed with RP-BIO-226 resulted in higher N, P K uptake compared to that of Vasumathi. This shows that RP-BIO-226 more efficient in extracting nutrients from soil. Furthermore, RP-BIO-226 accumulated greater amount of nutrients in grain compared to Vasumathi and Tulasi owing to higher grain yield over other varieties.

Similarly filled grains per panicle were 7 and 24.6% higher with RP-BIO-226 over Tulasi and Vasumathi. The grain yield with RP-BIO-226 was 9.6 and 39.6 % higher over Tulasi and Vasumathi varieties.

Panicles m², number of filled grains panicle⁻¹ are the yield components in rice which influence yield potential to a significant level. Since these yield components Panicles m² and number of filled grains panicle⁻¹ were RP-BIO-226. This had positively significant effect in obtaining higher grain yield. Similarly RP-BIO-226 recorded 27% and 40% higher straw yields over variety Tulasi and Vasumathi.

Increased dose of inorganic fertilizers (100% RDF) application resulted in 24% more height (90.6 cm) over control (70.6 cm). Similarly 58% more tillers were recorded by the treatment 50% vermicompost + 50% RDF over control. Application of 50% vermicompost with 50% RDF besides ensuring adequate nutrient supply might have energized soil microbial activity resulting in production of some growth promoting substances, which in turn could have helped in maintaining more tiller number and better growth parameter.

Inclusion of organic sources decreased soil density and slowed down the release of chemical N and its conversion to nitrates, thus reducing the leaching losses of nitrogen, better availability and uptake of nutrients which ultimately enhanced the total tiller number. These results are in conformation with those of Dobberman (2003) [4], Bharathy (2005) [2], who also reported beneficial effect of integrated use of inorganic (50% RDF) and organic (vermicompost) source on dry matter production at all growth stages of crop over the rest of the treatments. The treatment 50% RDF + 50% vermicompost enhanced the dry matter production by 36.7 and 71% at tillering stage and at harvest compared to control treatment. This enhancement of dry matter production of treatment was a mere of 8% compared to 100% RDF. In the present study nutrient management practices had pronounced positive influence on yield attributes like panicles m² and filled grains panicle⁻¹. Significantly higher number of panicles (236) and filled grains panicle⁻¹ (203) was observed with treatment 50% RDF + 50% vermicompost compared to other integrated nutrient management practices which was followed by 100% vermicompost, 25% vermicompost+ 75% RDF.

Nutrient Uptake

Nitrogen, phosphorous, potassium uptake was significantly affected due to varieties and Integrated nutrient management practices interaction effect was non –significant. Among the varieties RP-BIO-226 and Tulasi performed equally superior in terms of higher nitrogen uptake (62.5 kg / ha) as compared to vasumathi.

Among the integrated nutrient management practices 50% vermicompost + 50% RDF treatment registered highest nitrogen, phosphorous and potassium uptake over the other treatments

Table 1

	Grain yield (kg/ha)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	Total K uptake (kg/ha)
Main plots (varieties-V)				
Vasumathi	3248	88.8	23	103.5
Tulasi	4138	92.1	29.2	135.5
RP- BIO-226	4536	100.2	32.8	155.5
SE m±	124	0.5	0.6	1.6
CD (P=0.05)	484	1.7	1.2	3.5
Sub-plots (INM practices-N)				
Control	2922	63.4	20.9	91.8
100% vermicompost	3150	77.2	23.7	105.0
75% vermicompost + 25% RDF	3856	91.9	28.0	129.0
50% vermicompost + 50% RDF	5010	113.3	37.1	170.0
25% vermicompost + 75% RDF	4300	100.9	31.1	141.5
100% RDF	4606	105.8	33.8	158.0
SEm±	133	0.5	2.0	1.2
CD (P=0.05)	384	1.7	N.S.	2.6

Table 2: Gross and net returns (Rs. ha⁻¹) and benefit-cost ratio of rice as influenced by varieties and integrated nutrient management practices

SRI	Grain yield (kg / ha)	Straw yield (kg / ha)	Cost of cultivation (Rs / ha)	Gross returns (Rs / ha)	Net returns (Rs / ha)	Benefit cost ratio
Vasumathi						
Control	2748	3297	9700	67600	57900	5.9
100% vermicompost	2850	3386	19700	70093	50393	2.5
75% vermicompost + 25% RDF	3130	3756	17700	76998	59298	3.3
50% vermicompost + 50% RDF	3800	4560	15400	93480	78080	5.0
25% vermicompost + 75% RDF	3420	4104	13400	84132	70132	5.2
100% RDF	3520	4241	11400	87080	75600	6.6

Table 3: Gross and net returns (Rs. ha⁻¹) and benefit-cost ratio of rice as influenced by varieties and integrated nutrient management practices

SRI	Grain yield (kg / ha)	Straw yield (kg / ha)	Cost of cultivation (Rs / ha)	Gross returns (Rs / ha)	Net returns (Rs / ha)	Benefit cost ratio
Tulasi						
Control	2920	3504	9462	30752	21290	2.2
100% vermicompost	3200	3840	19462	34764	15302	0.7
75% vermicompost + 25% RDF	3940	4728	17462	41764	24302	1.93
50% vermicompost + 50% RDF	5430	6516	13462	57558	42096	3.7
25% vermicompost + 75% RDF	4360	5232	11462	46216	32754	2.4
100% RDF	4980	5967	15462	52788	41326	3.6

Table 4: Gross and net returns (Rs. ha⁻¹) and benefit-cost ratio of rice as influenced by varieties and integrated nutrient management practices

SRI	Grain yield (kg / ha)	Straw yield (kg / ha)	Cost of cultivation (Rs / ha)	Gross returns (Rs / ha)	Net returns (Rs / ha)	Benefit cost ratio
RP-BIO-226						
Control	3100	3720	9462	32860	23398	2.47
100% vermicompost	3400	4080	19462	36040	16578	0.85
75% vermicompost + 25% RDF	4500	5400	17762	47700	29938	1.68
50% vermicompost + 50% RDF	5800	6960	14462	61480	47018	3.25
25% vermicompost + 75% RDF	5120	6144	17512	54272	36760	2.09
100% RDF	5300	6360	11762	56180	44418	3.7

Seed cost (Rs/kg)

Vasumathi-30 Rs/kg

Tulasi-12.5 Rs/kg

RP-BIO-226-12.5 Rs/kg

Straw cost-0.50 Rs/kg

Grain cost (Rs/kg)

Vasumathi-24 Rs/kg

Tulasi-10 Rs/kg

RP-BIO-226-10 Rs/kg

Among the three varieties scented variety vasumathi recorded the highest gross returns, net returns and benefit cost ratio (Rs 93480, Rs 78080 and 1: 6.6) over RP BIO -226 (Rs 61480, Rs 47018 and 1:3.7) and tulasi (Rs 57558, Rs 42096, and 1:3.6) Among The Six Nutrient Management Practices The Highest Gross Returns And Net returns were observed with the application of 50% vermicom Post + 50% RDF But the highest benefit; cost ratio is recorded with 100% rdf treatment. Among all the treatment combinations highest net returns and benefit cost ratio recorded by scented variety vasumathi. Though gross and net returns were highest with 50% vermicompost + 50% RDF and maximum benefit cost ratio was recorded with 100% rdf, owing to higher cost of vermi compost. However the benefits of organics on soil productivity could be quantified in long run.

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