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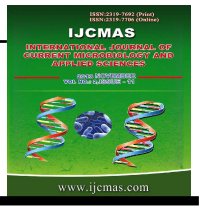

Original Research Article

Effect of organic manures on performance of scented varieties of rice in high altitude areas of Andhra Pradesh

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A B S T R A C T

Field experiment was conducted for three consecutive *rabi* seasons of 2009-10, 2010-11, and 2011-12 at Agricultural Research Station, Seethampeta, Andhra Prtadesh, India on sandy clay loam soil with four organic manures(Farm yard manure, Neem leaf manure, Sheep manure and Poultry manure) and four scented rice cultures(Pusa basmathi 1, Tararoi basmathi, RNR 2465 and RNR 18833) with an objective to find out suitable organic manure and an outstanding scented rice variety under organic farming particularly for high altitude areas of Andhra Pradesh. Among organic manures supply of 60 kg N ha^{-1} through Poultry manure found superior in terms of yield attributes, yield, root biomass nutrient uptake and returns. Noticeable varietal responses were observed under organic farming. Among the varieties, RNR 18833 can be chosen for yield and in pest & disease endemic areas, Pusa Sugundh and Pusa basmathi can be choosen for better grain quality

K e y w o r d s

Rice;
organic manures;
scented rice cultures;
yield;
economics.

Introduction

Organic farming plays an important and growing role in Indian agriculture. Emerging research ion organic farming has shown that organic production systems provides a comprehensive strategy for mitigating the ill effects of post green revolution .Repeated crop failures, decreasing marginal returns due to stagnating productivity and rising input cost , emergence of niche markets and patrons of alternate production strategies ushered the re discovery of organic production system in India. Rice is one of the major contributor of total food grain production of india, is now witnessed the yield stagnation and declining productivity due to continuous use of high level of chemical fertilizers had led to soil degradation problem

Organic farming provides a way for continued rice production by resource poor farmers. Further the low yields obtained in the organic farming are well compensated by higher price offered to organic foods. Studies suggest that yields could be sustained without increasing the nutrient inputs by tightening the nutrient cycles

through organic nutrition (Stockdale *et al.,* 2001) .Proper selection of a variety and appropriate nutrient management are important in organic rice production (Manjunath et al 2009) . Organic manures have the capacity to fulfill nutrient demand of crops adequately and promotes the activity of macro and micro flora in the soil (Sharma,2005).The area under scented rice varieties is increasing day by day with the opening of the world market as well as increased domestic consumption due to their premium quality (Singh *et al.,* 2008).High altitude and tribal area zone of Andhra Pradesh is endowed with the special soil and climate which suits better for organic farming particularly with scented rice cultivation compared to coastal plains, Now a days market facilities are also improved due to intervention of several agencies. Selection of proper variety, suitable to the specific ecological situation may prove to be a boon to the farmer. Hence a study was proposed to generate scientific data on combination of organic sources and varieties for organic rice in high altitude and tribal zone.

Materials and Methods

Field experiment was conducted for three consecutive *rabi* seasons of 2009-10, 2010-11, and 2011-12 at Agricultural Research Station, Seethampeta, Andhra Prtadesh, India. The soil was sandy clay loam having pH 6.8, organic carbon 0.62%, available nitrogen 257 kg ha^{-1}, available P_2O_5 26.1 kg ha^{-1} and K_2O 302 kg ha^{-1}. The treatments consisted of four main plots which supply 60 kg N ha^{-1} through organics(Organic manures i.e., M1-Farm yard manure(FYM), M2- Neem leaf,M3- Sheep manure and M4- Poultry manure) and four Subplots (Scented rice cultures *viz.,* S1- Pusa basmathi 1, S2- Tararoi basmathi, S3- RNR 2465 and S4- RNR 18833). The experiment was laid out in a Split plot design with three replications. The experimental site was same for the three years. Planted 30 days old seedlings at a spacing of 20X15 cm with 2-3 seedlings per hill. Weeds were controlled by two hands weeding at 20 and 40 days after transplanting. Water was maintained at a depth of 2 cm up to panicle initiation and 5 cm thereafter up to one week before harvest. The field was drained before application of fertilizers and one week before harvest. Organic manures were applied based on their nutrient content and incorporated two weeks before planting as per the treatment requirement. The experiments were received uniform plant protection and cultural management practices throughout the period of crop growth with neem oil and pseudomonas was utilized for pest and disease management. Data on yield attributes and yield, pest & diseases were collected following standard procedures from 10 randomly marked hills. Root volume at flowering was calculated using water displacement method. Root biomass & weed biomass was estimated at flowering duly following standard procedure. NPK uptake was calculated by multiplying nutrient content with dry matter production at harvest. The quality parameters were assessed as per the procedure given by Ghosh (1971).Data were analyzed using ANOVA and the significance was tested by Fisher's least significance difference (p= 0.05) by pooling three years data.

Results and Discussion

Effect of organic manures

Organic manures and varieties significantly influenced the tiller

production, yield attributes and yields, however the interaction between Organic manures, and varieties was not significant. Among the four Organic manures, supply of 60 kg N ha-^{1} through Poultry manure recorded significantly higher number of tillers, panicles, filled grains per panicle and thousand grain weight (Table 1) and these were ultimately resulted in higher grain yield .The variation in plant growth due to organic manures was due to variation in availability of nutrients. Quick release of N from poultry manure compared to other organic manure can be attributed for this superior performance. The other three Organic manures were found at par in production of tillers, yield attributes and yield. Straw yield was also higher with supply of 60kgNha-^{1} through Poultry manure. However Harvest Index did not differ markedly with different organic manures.Similar results were reported by Manjunath *et al.,* (2012).

Organic manures influenced significantly the root parameters and nutrient uptake (Table.2).Among the Organic manures, supply of 60 kg N ha-^{1} through Poultry manure recorded higher root volume , root biomass, and N & K uptake at harvest, which was significantly higher over Sheep manure manure and farm yard manure. Better and early nutrient availability with poultry manure might have helped in improved root biomass in this treatment which in turn increased the uptake of N & K. Whereas The P uptake was significantly higher with Sheep manure compared to FYM and neem leaf manure and it was found at par to poultry manure. The higher P content in sheep manure might have increased the P uptake, where it is applied.Application of organic manures enhances microbial activity that releases different organic acids which helps in solubilization of native soil nutrients and makes available for the uptake by plants. Organic manures provides regulated supply of nutrients by releasing them slowly and there by increases nutrient availability and corresponding uptake by plant (Bisht *et al.,* 2013).

Analysis of economic parameters shows that, the gross returns , net returns and rupee per rupee invested were higher with supply of 60 kg N ha-^{1} through Poultry manure followed by neem leaf manuring. Markedly higher profits with Poultry manure and neem leaf manuring might be due to higher grain yield coupled with lesser cost of cultivation. Whereas these parameters were least with Farm yard manure and Sheep manuring due to higher cost of cultivation of latter treatments. The milling and cooking quality parameters were didn't altered conspicuously by application of different Organic manures as well as their interaction with varieties(Table 3).Similar findings of non significant differences in milling quality and cooking quality of rice among different Organic manures was reported by Davari and Sharma (2010). However, amylase content and protein content of the grain were significantly higher with neem leaf manure. A conspicuous difference in quality aspects of rice varieties under organic farming was also reported by Raju *et al,* (2004).

Influence of organic Nutrient supply packages on pest & disease incidence was conspicuous but, the interaction effect of nutrient supply packages, and varieties was absent(Table 4). Among the organic manures, supply of 60 kg N ha-^{1} through Poultry manure noticeably increased the percent hispa damage, and BPH /hill, percent sheath blight & blast incidence, Whereas the, number of white ears /.m^{2,}

Table.1 Nutrient content of different organic manures

Organic manure	% N	% P	% K
FYM	0.91	0.42	0.57
Sheep Manure	1.68	0.91	1.16
Poultry manure	2.29	0.77	1.41
Neem Leaf	2.40	0.64	1.29

number of dead hearts /m^2 were higher with supply of 60 kg N ha^{-1} through FYM .On the other hand among organic manures, supply of 60 kg N ha^{-1} through neem leaf manure recorded conspicuously lower incidence of pest & diseases. Soils with a high functional diversity of micro organisms , which occur very often under organic agriculture practice , develop disease and insect suppressive properties and can help to induce resistance in plants(FileBbach *et al* .,2007).This supports the findings of Kajimura *et al*.(1995) who noted low densities of BPH & WBPH in organically cultivated fields and those with low N content.

Effect of Varieties:

Among the varieties, RNR 2465 recorded the highest number of tillers, panicles, total grains, filled grains per panicle and thousand grain weight, however, which was comparable in these parameters with RNR 18833 and significantly higher than Pusa basmathi and Pusa Sugundh (Table 1) . The grain yield straw yield and Harvest Index were higher in RNR 2465 followed by RNR 18833. As RNR 2465 has least affected by pest & diseases due to better tolerance to pest and diseases compared to other varieties might be the probable reason for this higher yield. Performance of the Pusa basmathi and Pusa Sugundh varieties were inferior compared to other varieties of the experiment was due their susceptibility to pest & diseases. Similar findings of differential response of varieties under organic farming due to pest and disease tolerance has been reported previously by Rao *et al.,* (2013).

Among the varieties, RNR 2465 follwed by RNR 18833 recorded conspicuously higher root volume, root biomass, nitrogen, phosphorus and potassium uptake at harvest and significantly higher than Pusa basmathi and Pusa Sugundh. While these parameters were lowest in Pusa basmathi .Higher root volume in RNR 2465 and RNR 18833 might have enhanced the nutrient uptake by these varieties compared to other varieties. Different varieties showed measurable differences in quality parameters and among the varieties the percent hulling ,milling and percent head rice recovery was higher in RNR 2465 & RNR 18833, whereas the L : B Ratio was higher in Pusa Sugundh and these parameters were at their least with Pusa basmathi. The other grain quality parameters like volume expansion ratio, elongation ratio, amylase content and protein content were statistically similar in all the four varieties.

Among the varieties RNR 2465 recorded higher gross returns, net returns and rupee per rupee invested due to higher grain yield lesser cost of cultivation. Whereas, these parameters were the lowest in Pusa basmathi. The lesser returns in pusa basmati were probably due the fact of lesser grain yield coupled with higher cost of cultivation in these varieties.

Table.1 Effect of organic manures and varieties on root growth, tillers, yield attributes and yields of rice.

Treatment	Tillers/ m^2	Panicles /m^2	Total grains/ panicle	Filled grains/ panicle	1000 grain wt. (g)	Root volume ml/plant	Root biomass g/hill	Grain yield (kg/ha)	Straw yield (kg/ha)	HI (%)
Organic manures										
M1- 60 kg ha^{-1} FYM- N	424	294	109	92	21.70	24.9	10.70	3739	5210	41.78
M2- 60 kg ha^{-1} Neem leaf- N	479	353	129	101	22.56	22.4	9.56	4127	5739	41.83
M3- 60 kg ha^{-1} Sheep manure- N	451	312	110	88	22.20	23.5	10.08	3914	5517	41.50
M4- 60 kg ha^{-1} Poultry manure- N	546	376	121	106	23.44	25.3	11.23	4405	5931	42.62
SEm ±	14.2	11.8	3.7	3.2	0.63	0.71	0.38	120	147	-
CD(P=0.05)	49	41	13	11	NS	2.45	1.31	415	509	-
Varieties										
S1- Pusa Sugundh	472	326	120	96	22.85	23.1	9.77	3910	5341	42.27
S2- Pusa basmathi	428	291	108	84	21.93	21.7	8.91	3609	4893	42.45
S3- RNR 2465	517	372	133	105	23.04	26.2	11.36	4415	5865	42.95
S4- RNR 18833	494	358	118	94	22.84	25.4	10.94	4164	5602	42.64
SEm ±	13.6	10.7	3.8	3.2	0.51	0.80	0.41	133	159	-
CD(P=0.05)	40	31	11	9	1.46	1.49	1.20	388	464	-

Table.2 Effect of organic manures and varieties on grain quality and nutrient uptake of rice

Treatment	Hulling (%)	Milling (%)	% HRR	L/B Ratio	VER	ER	Amylase Content (%)	Protein Content (%)	Uptake at harvest (kg ha^{-1})		
									N	P	K
Organic manures											
M1- 60 kg ha^{-1} FYM- N	74.20	69.83	55.42	3.77	4.52	1.89	22.46	7.53	93.39	20.23	91.60
M2- 60 kg ha^{-1} Neem leaf - N	74.39	71.06	57.21	3.82	4.47	1.86	23.86	7.70	103.75	20.85	106.40
M3- 60 kg ha^{-1} Sheep manure -N	75.43	70.40	56.10	3.79	4.35	1.93	22.98	7.51	90.82	22.57	99.80
M4- 60 kg ha^{-1} Poultry manure-N	74.20	69.83	55.42	3.77	4.52	1.89	23.46	7.63	107.39	21.23	111.60
SEm ±	1.12	1.05	1.02	0.21	0.28	0.11	0.18	0.14	1.75	0.46	2.01
CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	6.05	1.59	6.95
Varieties											
S1- Pusa Sugundh	76.1	65.7	47.5	3.91	4.47	1.95	24.0	7.55	98.1	19.7	92
S2- Pusa basmathi	74.5	66.1	48.7	3.88	4.32	1.89	23.7	7.59	92.7	18.2	88
S3- RNR 2465	78.9	70.0	59.5	3.51	4.21	1.73	22.7	7.69	106.3	21.8	127
S4- RNR 18833	77.3	68.5	57.4	3.64	4.15	1.77	23.1	7.63	101.5	20.5	111
SEm ±	1.06	1.11	1.05	0.12	0.17	0.09	0.43	0.09	2.05	1.02	2.11
CD(P=0.05)	3.1	3.2	3.1	0.35	NS	NS	1.26	NS	6.0	2.9	6.2

Table.3 Effect of organic manures and varieties on pest, disease incidence and returns of rice

Treatment	Dead hearts / m^2	White ears/m^2	BPH/ hill	% Leaf folder	% Sheath blight incidence	% Blast incidence	Weed biomass (g)	Gross Returns (Rs/ha^{-1})	Net Returns (Rs/ha^{-1})	R R I* (Rs/Rs)
Organic manures										
M1- 60 kg ha^{-1} FYM- N	25.64	27.47	29.99	8.90	21.84	16.01	21.84	77385	29765	0.63
M1- 60 kg ha^{-1} Neem leaf - N	18.18	20.14	25.39	6.94	16.79	12.65	24.53	85410	40225	0.89
M1- 60 kg ha^{-1} Sheep manure - N	22.62	23.37	36.35	7.89	24.64	18.48	26.92	81039	34189	0.73
M1- 60 kg ha^{-1} Poultry manure - N	24.75	26.82	38.24	10.24	29.32	21.78	29.63	91066	47951	1.11
SEm ±	1.16	1.22	1.62	0.59	1.12	0.85	1.03	1715	983	-
CD(P=0.05)	4.01	4.22	5.61	2.04	3.88	2.94	3.56	5934	3401	-
Varieties										
S1- Pusa Sugundh	23.1	27.5	33.9	11.5	22.1	19.3	25.2	80871	34219	0.73
S2- Pusa basmathi	25.6	28.0	32.1	15.3	24.7	28.3	27.3	74627	27975	0.60
S3- RNR 2465	19.4	16.3	22.5	9.6	15.4	16.5	21.0	91233	45483	0.99
S4- RNR 18833	21.1	20.0	26.9	8.1	18.4	17.2	24.4	86081	40331	0.88
SEm ±	1.35	1.29	1.45	0.73	1.21	0.97	1.17	1822	1015	-
CD(P=0.05)	3.94	3.77	4.23	2.13	3.53	2.83	3.42	5320	2964	-

BPH- Brown plant hopper; RRI Rupee returned per rupee invested

Among the varieties infestation of stem borer, Leaf folder, percent incidence of sheath blight, blast and Weed biomass were noticeably lower in RNR 2465 whereas number of BPH/Hill was lowest in RNR 18833.The pest and disease incidence was conspicuously higher in Pusa basmathi and Pusa Sugundh. Differences in pest and disease resistance among different varieties might be the reason for differences in incidence of pest and diseases in these varieties .These findings corroborating the findings of Ratnasudhakar *et al.*, (2004).

It can be concluded that, there was conspicuous difference among organic manures. Among organic manures supply of 60 kg N ha^{-1}through Poultry manure found superior in terms of yield attributes, yield, root biomass nutrient uptake and returns. Noticeable varietal responses were observed under organic farming. Among the varieties, RNR 18833 can be chosen for yield and in pest & disease endemic areas, Pusa Sugundh and Pusa basmathi can be chosen for better grain quality.

References

Bisht, A.S., Bhatnagar,A.and Singh,V.2013.Influence of integrated nutrient management on NPK content and uptake of Maize. Madras Agric. J. 100(1-3):110-112.

Davari,M.R.and Sharma ,S.N., 2010, Effect of different combination of organic materials and biofertilizers on productivity, grain quality and economics in organic farming of basmati rice. Indian J. of Agron. 55: 290- 294

FileBbach, A., Oberholzer, H.R. , Gunst, L .and Mader, P. 2007. Soil organic matter and Biological soil quality indicators after 21 years of organic and conventional farming. Agric. Ecosystems and environment, 118:273-284.

Ghosh, A. K ., 1971. Influence of nitrogen on physico-chemical characteristics of rice grain. Oryza., 8: 81-98.

Kajimura, T., Fujisaki, K., Nagsuji ,F .1995.Effect of organic farming on leaf hoppers, plant hoppers and aminoacid contents in rice phloem sap and survival rate of plant hoppers. Appl.Entomol. 30 : 17-22.

Manjunath,B.L.,Prabhudesai HR.,Wasnik HM.,Falerio JR.,Ramesh ,R., Talashilkar ,S. 2009. Glimpses of three decades of rice research in Goa,Technical Bulletin No 19,ICAR Research Complex Goa. pp.50.

Raju,M.S., Ratnasudhakar ,T., Madhusudhan, T., Reddy, T.D., and Reddy, P.N. 2004.Influence of Organic farming in rice. Paper presented in: National symposium on Organic farming prospects and challenges in the millennium, Rajendra nagar Hyderabad, pp.38-41.

Rao, A.U., Murthy, K.M. D., SridharT. V. and Srinivas, D. 2013**.** Studies On Performance Of Organic Farming And Chemical Farming In Rice – Rice System. J. Eco-Friendly Agriculture. 8(1):15-19.

Ratnasudhakar, T., Raju, M.S., Madhusudhan, T. ,Reddy ,T.D., Reddy, P.N. and Gangaram, A. 2004. Effect of Organic farming on the incidence of insect pests in rice. Paper presented in: National symposium on Organic farming prospects and challenges in the millennium, Rajendranagar Hyderabad, pp. 166-168.

Sharma, K. A., 2005. The potential for organic farming in drylands of India. Arid lands newsletter (Soil management for drylands).,*http://ag.Arizona.EdU/OALSIA L.N home.Ltml*, :58

Singh, R.P., Mehta, S.N. and Godara, A.K. 2008.Adoption of fertilizers and weedicides in basmathi ricein Kurukshetra Dist(Haryana). Agric. Sci.Digest. 28(1):36-38.

Stockdale, E.A., Lampkin, N.H., Hovi .M .,Keatings, R., Lennartsson, E. M. , Macdonold, D.W,. Padel, S., Tattersall, F.H., Wolfe, M.S., and Watson, C.A. 2001,Agronomic and environmental implications of organic farming systems. Advan. Agron.70: 261- 327.