SHORT COMMUNICATION

Oryza Vol. 51 No.1, 2014 (90-92)

Effect of different organic manures on yield, nutrient availability and soil microflora in transplanted rice

M Padmanabhan, M Hanumanthappa, Shamaraj and L Nagesh

University of Agricultural Sciences, GKVK, Bangalore - 560 065

**Email : padmanabhanmk007@gmail.com*

ABSTRACT

Field investigation was conducted during wet season of 2012-13 at Zonal Agricultural Research Station, Brahmavar, Bengaluru, to study the effect of different organic manures on growth and yield of transplanted rice. The results indicated that application of 50 per cent recommended dose of nitrogen (60 kg ha^{-1})(RDN) through goat manure + 50 per cent N through bio-digested liquid manure increased grain yield and straw yield in transplanted rice which is evidenced by increase in soil microflora resulting in better availability of nutrients to crop.

Key words: *transplanted rice, yield, nutrient availability, soil microflora*

Generally, rice plant requires large quantity of major nutrients in addition to secondary nutrients such as calcium and zinc for better growth and grain yield. With increase in cost of cultivation due to increased labour cost and other input cost, there is need for a fresh look to exploit the organic farming approaches using the local manorial sources for growing rice without using much of purchased chemical fertilizers, pesticides which minimize environmental pollution and maintain the fertility of soil on sustainable basis. With this in mind, an investigation was undertaken to identify suitable organic sources to maintain better soil health and enhance soil productivity on sustainable basis.

A field experiment was carried out at Zonal Agricultural Research Station, UAS, Bengaluru, during wet season of 2012-13. Field experiment was laid out in randomized complete block design with treatments replicated thrice. The treatment combinations included five organic manures *viz.,* glyricidia, euphotorium, poultry manure, vermicompost and goat manure and two liquid organic manures *viz.,* cattle urine and bio digested liquid manure (BDLM) and are compared with recommended dose (60 kg ha^{-1}) of Nitrogen (RDN). The different organic manure combinations *viz*., 50% RDN through glyricidia + 50% N through cattle urine, 50% RDN through eupatorium + 50% N through cattle urine, 50% RDN through poultry manure + 50% N through cattle urine, 50% RDN through vermicompost + 50% N through cattle urine, 50% RDN through goat manure + 50% N through cattle urine, 50% RDN through glyricidia + 50% N through BDLM, 50% RDN through eupatorium + 50% N through BDLM, 50% RDN through poultry manure + 50% N through BDLM, 50% RDN through vermicompost+50% N through BDLM, 50% RDN through goat manure+50%N through BDLM, RDF (60:30:45 kg N, P_2O_5, K_2O ha^{-1}) were included. The soil of experimental site was sandy loam and acidic in nature. It has high organic carbon content 0.83 per cent with pH 5.04 and EC 0.048 dsm^{-1}. Available nitrogen (325 kg ha^{-1}) was medium, available phosphorus (62.01 kg ha^{-1}) was high and available potassium (157.63 kg ha^{-1}) was medium.

Results of the present field trial indicated that higher grain (5.11 t ha^{-1}) and straw yield (6.10 t ha^{-1}) were produced by the application of 50 per cent RDN through goat manure + 50 per cent N through BDLM (Table 1). However, it was followed by the application of 50 per cent RDN through vermicompost + 50 per cent N through BDLM (4.96 t ha^{-1} and 5.87 t ha^{-1}). The higher yield might be attributed to higher yield parameters *viz*., number of productive tillers hill^{-1}, number of grains panicle^{-1} and thousand grain weight.

Table 1. Effect of different organic manures on grain yield, straw yield and nutrient availability in transplanted rice

Treatments	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Available nitrogen (kg ha^{-1})	Available P_2O_5 (kg ha^{-1})	Available K_2O (kg ha^{-1})
50% RDN through glyricidia + 50% N through cattle urine	4.24	4.87	298.51	46.59	135.12
50% RDN through eupatorium + 50% N through cattle urine	3.90	4.42	311.40	51.06	147.33
50% RDN through poultry manure+ 50% N through cattle urine	4.42	5.10	292.96	43.70	131.22
50% RDN through vermicompost + 50% N through cattle urine	4.51	5.20	282.03	41.02	126.43
50% RDN through goat manure + 50% N through cattle urine	4.84	5.56	265.69	34.64	115.62
50% RDN through glyricidia + 50% N through BDLM	4.70	5.44	276.01	36.87	119.97
50% RDN through eupatorium + 50% N through BDLM	4.07	4.64	304.72	49.71	140.02
50% RDN through poultry manure + 50% N through BDLM	4.92	5.70	254.41	30.54	109.58
50% RDN through vermicompost + 50% N through BDLM	4.96	5.87	244.10	26.52	103.80
50% RDN through goat manure + 50% N through BDLM	5.11	6.10	238.00	22.54	98.39
RDF (60:30:45 kg N, P_2O_5, K_2O ha^{-1})	4.35	4.97	291.10	40.78	129.53
CD (P<0.05)	0.14	0.21	5.50	2.84	3.85

Cattle urine and BDLM was applied in 3 split doses, BDLM- Bio digester liquid manure, RDN-Recommended dose of Nitrogen, RDF-Recommended dose of fertilizer.

Similar results of higher yield by application of goat manure were reported by Mehtha and Singh (2009). They reported that due to better congenial condition for microbial growth, application of goat manure with biofertilizer showed higher grain and straw yield of rice.

Lower grain yield (3.90 t ha^{-1}) and straw yield (4.42 t ha^{-1}) were produced by the application of 50 per cent RDN through eupatorium + 50 per cent N through cattle urine (Table 1) and this might be due to low moisture content in eupatorium which affected the rate of decomposition and release of N which affected grain and straw yield. Similar results were evinced by Yadav Singh (2000). The other reason for lower yield with incorporation of eupatorium may be due to lower concentration micro nutrients compared to other green manures. This was in conformity with the findings of Kanwar (2010) who observed that eupatorium had contain lower amount of micro nutrients compared to other green manures.

Table 2. Effect of different organic manures on population of soil micro-organisms after harvest of transplanted rice

Treatments	Bacteria (cfux10^6 g^{-1} of soil)	Fungi (cfux10^3 g^{-1} of soil)	Actinomycetes (cfux10^3 g^{-1} of soil)
50% RDN through glyricidia + 50% N through cattle urine	45.26	54.87	32.06
50% RDN through eupatorium + 50% N through cattle urine	42.73	53.21	29.58
50% RDN through poultry manure+ 50% N through cattle urine	21.06	38.27	9.51
50% RDN through vermicompost + 50% N through cattle urine	25.05	40.43	13.03
50% RDN through goat manure + 50% N through cattle urine	29.06	44.85	16.62
50% RDN through glyricidia + 50% N through BDLM	51.22	62.45	38.98
50% RDN through eupatorium + 50% N through BDLM	47.12	57.07	35.07
50% RDN through poultry manure + 50% N through BDLM	33.25	47.66	20.23
50% RDN through vermicompost + 50% N through BDLM	36.26	49.20	23.12
50% RDN through goat manure + 50% N through BDLM	40.28	51.81	27.02
RDF (60:30:45 kg N, P_2O_5, K_2O ha^{-1})	17.50	20.75	6.50
CD (P<0.05)	3.89	4.18	3.42

Initial microbial count: Bacteria=16; Fungi=18; Actinomycetes=6; Cattle urine and BDLM was applied in 3 split doses

BDLM-Bio digester liquid manure, RDN-Recommended dose of Nitrogen, RDF-Recommended dose of fertilizer, cfu-colony forming unit

Higher available nitrogen (311.40 kg ha^{-1}) after the crop harvest was observed with the application of 50 per cent RDN through eupatorium + 50 per cent N through cattle urine. However, it was followed by the application of 50 per cent RDN through eupatorium + 50 per cent N through BDLM (304.72 kg ha^{-1}). The experimental results holds well with the findings of Chakor and sharma (2008) they revealed that locking of nutrients in the soil by the incorporation of fresh mass of eupatorium resulted in the decrease in the uptake of nutrients and thereby availability of N after harvest of crop is more compared to other organic manures.

Lower available nitrogen (238.0 kg ha^{-1}) was observed with application of 50 per cent RDN through goat manure + 50 per cent N through BDLM. Similar trend was observed with respect to available, phosphorus and potassium due to higher uptake of nitrogen (129.47 kg ha^{-1}), the available N was lower with application of 50 per cent RDN through goat manure + 50 per cent N through BDLM. The application of goat manure in combination with BDLM enhanced the microbial activity and availability of nutrients which results in higher uptake of nutrients by rice crop (Reddy *et al* 2010).

Higher population of bacteria, fungi and actinomycetes (51.22 cfu X 10^6 g^{-1} of soil, 62.45 cfu X 10^3 g^{-1} of soil and 38.98 cfu X 10^3 g^{-1} of soil) was found with application of 50 per cent RDN through glyricidia + 50 per cent N through BDLM (Table 2), which was followed by application of 50 per cent RDN through eupatorium + 50 per cent N through BDLM (47.12 cfu X 10^6 g^{-1} of soil, 57.07 cfu X 10^3 g^{-1} of soil and 35.07 cfu X 10^3 g^{-1} of soil).

Lower bacteria, fungi and actinomycetes population (17.50 cfu X 10^6 g^{-1} of soil, 20.75 cfu X 10^3 g^{-1} of soil and 6.50 cfu X 10^3 g^{-1} of soil) was recorded with application of recommended dose of fertilizer (Table2). Recommended dose of fertilizer affected the microbial population due to chemical effects of fertilizer and lack of organic matter by applying only chemical fertilizers (Kumaran, 2010).

Application of glyricidia and BDLM was highly beneficial in improving bacteria, fungi and actinomycetes population in the soil. Similar results of improved soil physical, chemical and biological properties by the application of glyricidia and eupatorium were reported by Mondal *et al*. (2003).

REFERENCES

Chakor B and Sharma N 2008. Effect of organic manures and crop residues on the yield of rice, mustard and potato in the gangetic alluvial soil of West Bengal. Intern. J. Trop. Agric.17: 1-4.

Kanwar P 2010. Effect of application of green manures on available nutrient status of soil in rice-wheat cropping system. Indian J. Eco.,42: 13-16.

Kumaran 2010. Effect of nutrient sources on growth and yield of direct seeded rice (*Oryza sativa* L.). Crop Res., 29: 19-23.

Mehtha and Singh 2009. Application of vermicompost in combination with bio fertilizers on the yield, quality and nutrient uptake of rice. J. Indian Soc. Sci.,47(1): 166-169.

Mondal SS, Sitamgshusarkar Aruoghosh and Das J 2003. Response of summer rice (*Oryza sativa* L.) to different organic and inorganic sources of nutrients. Crop Res., 25 (2): 219-222.

Reddy VC, Shivanandanam V, Jayaram Reddy M, Sannathimmappa M, Bhairappanavar ST, Girijesh GK, Narayanprasad Mohan GS, Vasanthkumar HL, Govindaraju C, Jagadeesh BR, Basavaraj Naik TC and Hanumanthappa M 2010. Developing organic package of practices for production of paddy, ragi, maize, groundnut, red gram, field bean and soybean. Ann. Prog. Rep., Research Institute on Organic Farming, Univ. Agric. Sci., Bangalore. Pp. 26-127.

Yadav Singh 2000. Effect of continuous manuring on soil properties of an alfisol. J. Indian Soc. Soil Sci., 33: 700-704.