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Effect of organically supplemented N on yield of rice (*Oryza sativa* L.)

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ABSTRACT

A field experiment was conducted to study the effect of organic sources of nutrients (enriched FYM compost, vermicompost, FYM + neem cake, enriched FYM compost + vermicompost + FYM, composted poultry manure and enriched poultry manure compost) and recommended NPK fertilizer on rice. The results revealed that the application of enriched poultry manure compost on equal N basis (2.3 t ha^{-1}) recorded higher yield attributes and grain yield of 4675 kg ha^{-1} in 2007 and 4953 kg ha^{-1} in 2008, which was however comparable with composted poultry manure and better than other organic manure treatments and also inorganic source treatment. The lower grain yield obtained with absolute control which did not receive organic manures and recommended NPK addition.

Key words: Attributes, manures, rice

Modern chemical based agriculture practices led to decline in productivity, environmental degradation and ecological imbalance. Under such situations organic nutrient management has gained a significant role in improvement of soil fertility and crop productivity. Energy crisis, higher fertilizer cost, sustainability in agri-production system and ecological stability are the important issues which renewed the interest of farmers and research workers in non-chemical sources of plant nutrients like biofertilizers, farmyard manure, green manure, composts etc. Awareness about crop quality and soil health increased the attention of people towards organic farming (Sharma *et al.*, 2008). The present study was undertaken to find out the effect of organically supplemented N on rice yield.

MATERIALS AND METHODS

A field experiment was conducted during *rabi* season (August - January) of 2007 and 2008 in 'N' block of the wetland farm, Tamil Nadu Agricultural University, Coimbatore. The farm is situated in Western Agro-climatic Zone of Tamil Nadu at 11° North latitude and 77° East longitude with an altitude of 426.7 m above MSL. The soil of the experimental field was clay loam in texture having a slightly alkaline pH of 8.1 with low soluble salts (EC = 0.45 dS m^{-1}), medium organic carbon content (0.62 per cent), low in available N (262 kg ha^{-1}), medium in available P (18.2 kg ha^{-1}) and high in available K (576 kg ha^{-1}).

The field experiment was laid out in Randomized Block Design with three replications. The experiment consisted of eight treatments *viz.*, T_1: Enriched FYM compost, T_2: Vermicompost, T_3: FYM + neem cake (1/2+1/2), T_4: Enriched FYM compost + vermicompost + FYM (1/3+1/3+1/3), T_5: Composted poultry manure, T_6: Enriched poultry manure compost, T_7: Recommended NPK fertilizer i.e. RDF (75: 50: 50 kg N:P:K ha^{-1}) and T_8: Absolute control (without organic and inorganic). The pre-season green manuring of *Sesbania aculeata* (Dhaincha) was sown prior to rice crop uniformly and *in situ* incorporated at 47 days after sowing, three weeks before rice transplanting. Based on the equal N basis, required quantities of organic manures on dry weight basis were incorporated in the soil two weeks before transplanting of rice. The consumer preference rice variety, improved white ponni was raised. Transplanting of 30 days old seedlings was done in the main field with a spacing of 20 x 10 cm at two seedlings hill^{-1}. The plots were irrigated with one cm of water for one week after transplanting. The depth of water was increased from one cm to five cm as the crop advanced in age. Irrigation was given with five cm depth of water after the establishment stage one day after the disappearance of ponded water. Irrigation was stopped 15 days before harvest. The crop was harvested during December in 2007 and 2008. The total duration of the crop was 140 days.

The enriched FYM compost was prepared by using 10 kg of rock phosphate and 10 kg of each biofertilizers *viz.*, *Azospirillum*, *Azotobacter* and Phosphobacteria were thoroughly mixed with 1000 kg of well decomposed and powdered FYM on dry weight basis and made into a heap like structure. The heap was kept for 60 days for composting under the shade with 60% moisture. For composted poultry manure, 100 kg of bits of chopped rice straw was mixed with 1000 kg of poultry manure on dry weight basis and made into a heap like structure. The heap was kept for 60 days for composting under the shade with 60% moisture. The enriched poultry manure compost was prepared by using 20 kg of rock phosphate and 10 kg of each biofertilizers *viz.*, *Azospirillum*, *Azotobacter* and Phosphobacteria were

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thoroughly mixed with 1000 kg of poultry manure on dry weight basis and made into a heap like structure. The heap was kept for 60 days for composting under the shade with 60% moisture as suggested by Sims *et al.* (1992). The manurial value of organic manures were analysed and quantity required for the experiment was worked out based on equal N basis (Table 1). The P and K requirement was not supplied separately and whatever contained in the organic sources are taken into account.

RESULTS AND DISCUSSION

Yield attributes

Application of enriched poultry manure compost recorded increased number of panicles m^{-2} and grains $panicle^{-1}$ and it was comparable with composted poultry manure. These were followed by recommended NPK fertilizer (Table 2). The enriched poultry manure compost increased number of panicles m^{-2} (35.8 and 36.3 per cent) and filled spikelets $panicle^{-1}$ (54.6 and 65.6 per cent) than absolute control during *rabi* 2007 and 2008, respectively (Fig 1&2). This might be due to higher concentration of macro and micronutrients in the enriched poultry manure compost and composted poultry manure and higher and steady nutrient release compared to other organic manures. Further, the poultry waste had both urinary and fecal excretion, hence the fertilizer value was nearly three times higher than FYM (Devegowda, 1997). The enhanced and continuous supply of nutrients by the enriched organics leading to better tiller production enhanced panicle length and filled grain of rice (Mohandas *et al.*, 2008).

Grain yield

Application of enriched poultry manure compost recorded higher grain yield, which was found to be on par with composted poultry manure (Table 2). These were followed by recommended NPK fertilizer, which was however comparable with composted poultry manure in both the years. The lower grain yield was recorded in absolute control during both the years. The enriched poultry manure compost increased grain yield over recommended NPK fertilizer was 7.7 per cent during 2007 and 9.1 per cent during 2008. The supremacy of enriched poultry manure compost lies in the fact that it can supply the nutrients in soluble form for a quite longer period by not allowing the entire soluble form into solution, to come in contact with soil and other inorganic constituents, thereby minimizing fixation and precipitation from the enriched manures, the plant roots can very well compete with loss mechanisms and absorb more nutrients leading to better yield. This falls in line with the findings of Mohandas *et al.* (2008). The results of the present study indicated that the application of enriched poultry manure compost on equal N basis (2.3 t ha^{-1}) recorded higher grain yield of 4675 kg ha^{-1} in 2007 and 4953 kg ha^{-1} in 2008, which was comparable with composted poultry manure.

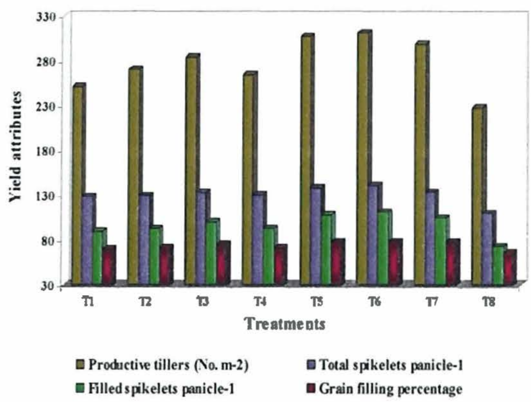

Fig. 1: Effect of organic manures on yield attributes of rice (*Rabi* 2007)

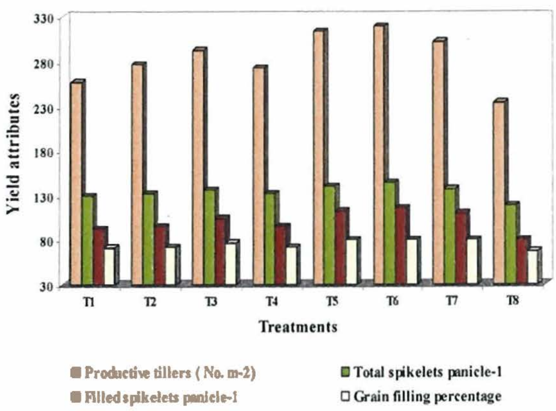

Fig. 2: Effect of organic manures on yield attributes of rice (*Rabi* 2008)

Table 1: Nitrogen content of organic manures on dry weight basis

Organic manures	Total N content (%)		Quantity added to substitute 100% recommended N for rice (75 kg ha^{-1})	
	2007	2008	2007	2008
Farmyard manure	0.60	0.50	12500	15000
Enriched farmyard manure compost	1.41	1.32	5319	5682
Vermicompost	1.91	1.74	3927	4310
Composted poultry manure	2.27	2.23	3304	3363
Enriched poultry manure compost	3.20	3.22	2344	2329
Neem cake	4.20	3.80	1786	1974

Table 2: Effect of organic nutrient sources on rice

Treatments	Panicles (No. m^{-2})		No. of filled grains $panicle^{-1}$		Grain yield (kg ha^{-1})	
	2007	2008	2007	2008	2007	2008
Enriched FYM compost	252	257	90.1	92.3	3250	3460
Vermicompost (VC)	271	277	93.2	95.6	3667	3923
FYM + Neem cake	285	293	100.5	104.2	4012	4297
Enriched FYM compost + VC + FYM	265	273	93.1	95.4	3576	3807
Composted poultry manure	308	314	108.5	112.4	4482	4784
Enriched poultry manure compost	312	319	111.3	115.9	4675	4953
Recommended NPK fertilizers	299	302	104.9	109.5	4340	4538
Absolute control	228	234	73.1	80.2	2550	2635
SEm(±)	**5.7**	**7.3**	**2.86**	**2.89**	**149**	**155**
LSD (0.05)	**12.1**	**15.7**	**6.14**	**6.19**	**320**	**333**

FYM : Farmyard manure

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