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'N' Release Pattern in Poultry Manured Soil

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Abstract: An incubation study was conducted at Veterinary College & Research Institute, Namakkal, Tamil Nadu, to examine the changes in availability of N in poultry manure applied soil either singly or in combination with other organic manure (FYM). Treatments consisted of Farmyard manure (FYM), Poultry manure (PM), Composted poultry manure (CPM), FYM + PM, FYM + CPM along with control were replicated four times in a CRBD. The processed experimental soil samples weighing 1 Kg were filled in polyethylene containers and incubated with different organic manures (FYM, PM, CPM, 50 % FYM + 50% PM and 50 % FYM + 50 % CPM) and control at 30 ± 5°C for 150 days. The study revealed that all treatments involving organic manure addition had significantly higher available N over control throughout the study. Poultry manure can be effectively used by composting to increase the available soil N progressively thus enable the manure to release the nutrients steadily and make it available to the plants for a longer period of time without much loss.

Key Words: Poultry manure, incubation, composting, N availability

INTRODUCTION

It is well established that organic manures influence the availability of soil N. However, the availability of soil N varies with types of organic manures. Further, the transformation of N in manured fields greatly varies with soil types. Poultry manure is one of the richest sources of N. The N availability from the manure is subjected to various losses through volatilization, denitrification, immobilization, mineralization and leaching[2]. Rapid mineralization occurs immediately after the application of poultry manure. Bitzer and Sims[1] reported that 69 per cent of organic N in poultry litter mineralized in 140 days in a sandy soil but volatilization takes place instantly on incorporation. Wolf *et al.*,[8] found that 37 % of the total - N in surface applied poultry manure was volatilized in 11 days. With these ideas in view, as a basic study, an experiment was initiated to study the effect of composted poultry manure on the release pattern of soil N.

MATERIALS AND METHODS

An incubation study was conducted at Veterinary College & Research Institute, Namakkal, Tamil Nadu, to examine the changes in availability of soil N in poultry manure applied soil either singly or in combination with other organic manure (FYM).

Table 1: Chemical properties of manures used in the experiment

Particulars	FYM	Poultry manure (PM)	Composted poultry manure (CPM)
N content (%)	0.55	2.2	1.92
P content (%)	0.48	1.41	1.35
K content (%)	0.9	1.52	1.55
pH	7.6	6.4	7.1
C: N ratio	20 :1	10 :1	19 :1

Treatments consisted of Farmyard manure (FYM), Poultry manure (PM), Composted poultry manure (CPM), FYM + PM, FYM + CPM along with control were replicated four times in a CRBD.

The experimental soil was sandy loam in texture, slightly alkaline in pH (7.8), free from soluble salts (0.4 dsm $^{-1}$), low in organic status (0.46 per cent) and poor in fertility status. Soil samples were partially air-dried and sieved through 2 mm and used for the incubation study. The processed soil samples weighing 1 Kg were filled in polyethylene containers. The soil samples were then incubated with different organic manures (FYM, PM, CPM, 50 % FYM + 50% PM and 50 % FYM + 50 % CPM) and control at 30 ± 5°C for 150 days.

Composting of poultry manure was initiated using poultry manure (droppings from cages) and chopped sorghum straw. Poultry manure was mixed with bits of sorghum straw at the rate of 10:1 and packed in dug pits and closed with mud plaster. To maintain optimum moisture, water was sprinkled before it is

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Table 2: Available N status (mg kg^{-1}) of soil blended with organic manures

Treatments	Soil available N (mg kg^{-1})						
	Days after incubation						
	15	30	45	60	90	120	150
1. No manure (control)	113.9	114.2	111.7	110.6	107.5	106.2	100.9
2. FYM 12.5 g kg^{-1}	114.8	116.2	118.1	119.4	119.8	116.2	110.8
3. PM 5 g kg^{-1}	139.8	121.1	119.6	119.2	120	116.3	112.1
4. CPM 5 g kg^{-1}	118.4	120.4	122.3	123.5	123.8	121.8	117.6
5. FYM 6.25 g + PM 2.5 g kg^{-1}	128.7	120.7	120.8	121.1	121.2	118.4	115.7
6. FYM 6.25 g + CPM2.5 g kg^{-1}	116.9	119.3	121.2	122.6	123	120.8	115.9
SE_d	0.8	0.9	0.8	0.9	0.6	0.8	0.9
CD (P = 0.05)	1.8	1.9	1.8	2	1.3	1.8	2.0

FYM - Farm yard manure, PM- Poultry manure, CPM - Composted poultry manure

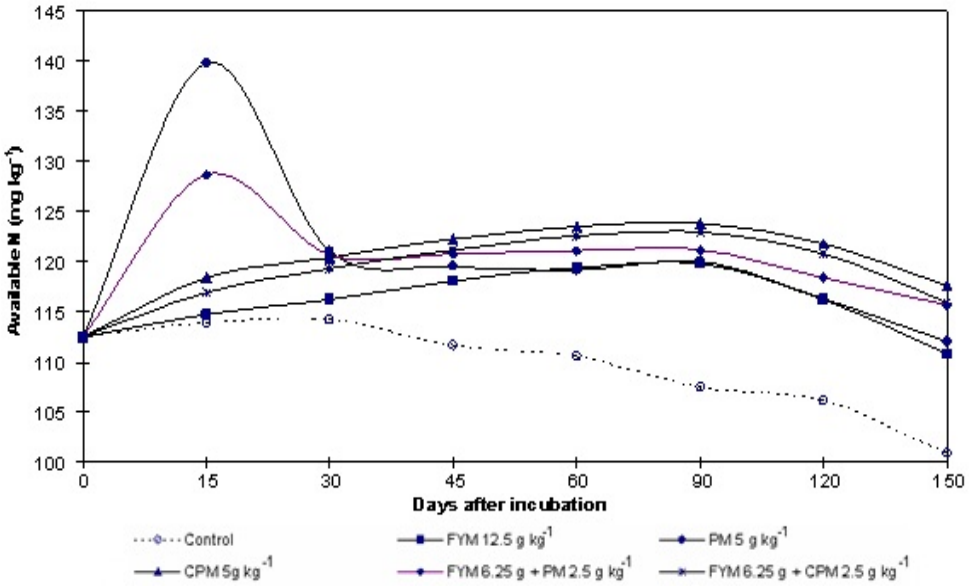

Fig. 1: Available N in the soil after incubation with organs manures.

being packed and left under anaerobic conditions for 75 days as suggested by Sims *et al.,*[6]. The chemical properties of the manures used in the investigation are presented in Table 1.

FYM was applied @ 12.5 g kg-1 of soil while PM and CPM @ 5 g kg-1 of soil and thoroughly mixed by hand with the dried soil before incubation. Moisture content of the substrate was maintained below saturation capacity by periodical watering. Soil samples from the containers were drawn at periodical intervals (15, 30, 45, 60, 90, 120 and 150 days after incubation) and tested for their soil available nitrogen. Available N in soil was determined by the method suggested by Subbiah and Asija[7]. The data collected from the study were statistically analyzed.

RESULTS AND DISCUSSIONS

The available N of the soil increased progressively up to 90 days after incubation and decreased slowly in all the treatments except control wherein N decreased progressively from 30 to 150 days and the magnitude was negligible (Table 2 and Fig 1). All treatments involving organic manure addition had significantly higher available N over control throughout the study. This is in conformity to the findings of Rayar[5] who observed an increase in available N when poultry manure and FYM were applied to the soil.

The available N under poultry manure treated soil was markedly higher at 15 days of incubation followed by PM + FYM, CPM, FYM + CPM and FYM alone. Mineralization of organic N present in poultry manure

ought to have occurred rapidly. Bitzer and Sims[1] reported that major portion of N get mineralized (69%) within 140 days. At 30 days, PM amended soil had the highest available N but was comparable with PM + FYM and CPM treatments. From 45 days onwards up to 150 days CPM recorded the highest available N followed by FYM + CPM and PM + FYM and were comparable. This may be due to volatilization of ammonical-N present in poultry manure and immobilization. Wolf *et al*.,[8] stated that 37 per cent of the total - N in surface applied poultry manure was volatilized in 11 days. Volatilization losses significantly reduced the amount of N available for plant uptake. Gale and Gilmour[4] and Chescheir *et al*.,[3] have suggested immobilization was responsible for reducing inorganic N shortly (1-2 weeks) following application of poultry waste.

Conclusion: The study revealed that all treatments involving organic manure addition had significantly higher available N over control throughout the study and hence suggests that poultry manure can be effectively used by composting the poultry manure to increase the available soil N progressively thus enable the manure to release the nutrients steadily and make it available to the plants for a longer period of time without much loss.

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