Effect of Poultry Manure as a Top Dressing on Lowland Rice (*Oryza sativa* L.) Production

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ABSTRACT

Availability of organic manure as a basal dressing is a problem in some areas. Therefore, this investigation was carried out to evaluate the effect of top dressings by poultry manure and inorganic fertilizers on the growth and the yield of paddy. Top dressing by poultry manure and inorganic fertilizer were the two treatments of this experiment. Basal fertilizers were applied according to the Department of Agriculture (DOA) recommendation. Six rice plots of 300m^2 each were used to apply two treatments according to a randomized complete block design with 3 replicates. As a top dressing, dried poultry manure was applied for the three plots at the rate of 400kg/ha in 3 split applications and for the other three plots, Urea was applied at the rate of (72kg/ha, 120kg/ha, and 48kg/ha) 2,5,6 weeks after broad casting respectively. Poultry manure gave higher yield (5.01t/ha) than inorganic fertilizer (4.38t/ha). Growth and yield components were not significantly different ($p>0.05$) in both treatments. Poultry manure acted as a substitute for Inorganic fertilizer.

KEYWORDS: Poultry Manure, Rice, Top Dressing, Yield Components.

INTRODUCTION

Rice (*Oryza sativa* L.) is a single most important crop occupying 34% of the total cultivated area in Sri Lanka. An average of 560,000ha is cultivated during Maha and 310,000ha during Yala. About 1.8 million farm families are engaged in paddy cultivation island wide (Anon, 2004).

Soil fertility is very important for the productivity of rice. As rice is a continuously cultivated crop through out the year, high amounts of nutrients are removed with harvest and by drainage, run off water and leaching. Even though 99% total rice lands are being cultivated with improved varieties with potential yield over 7.5-10t/ha, the national average yield has been stagnated around 3.5 t/ha, since 1980's (Anon, 2004).

With high Yielding rice varieties more fertilizers are needed. Therefore, inorganic fertilizers are important ingredient of modern farming. Due to economic difficulties and high cost of production in many Asian third world countries, rice farmers are unable to purchase the inorganic fertilizers because of their high price. Some of equivalent organic fertilizers can be used to replace inorganic fertilizers (Mang-Umphan, *et.al.*, 1988). Organic fertilizer is relatively cheap and could make considerable contribution to rice field fertility (Mang-Umphan, *et. al.*1988). Good tillering ability and medium height have been recorded due to application of organic fertilizer as a top dressing (Nawarathna, 2003). Poultry manure has high nutritive value (N-2.95%, P_2O_5-3.46%, K_2O-2.25%) compare to other organic fertilizers (Dayananda, 2004).

Most of the scientists have proven that organic manure can be used as a basal dressing, when poultry manure is used as a basal dressing, very large amounts about 5t/ha or more are required (Nagarajah, 1980). Practically, such amounts are rarely found. There is a possibility to supplement top dressing of inorganic fertilizer with poultry manure whenever available. On the other hand, combination of poultry manure with inorganic fertilizer is giving better results in the long run (Nagarajah, 1980). China and Japan are some countries where maximum exploitation of organic manures is practiced. Then, recent fuel crisis has made chemical fertilizers expensive and difficult to obtain. In this experiment, application of poultry manure as a top dressing was evaluated inorder to encourage farmers to apply Poultry manure.

The objectives of this experiment are, to study the possibility of using poultry manure as a top dressing for rice production, to evaluate the effect of poultry manure on pest and disease incidences in rice and to reduce the cost of production by incorporating poultry manure as a substitute for inorganic fertilizer.

MATERIALS AND METHODS

Experiment was conducted in a selected paddy field at Erriyagolla, Low country Intermediate zone (IL1a), during 2004/2005 Maha season.

Six rice plots of 300m^2, which had been used for the rice cultivation for 35 years, were used for the experiments during the study period. Two following treatments were arranged in randomized complete block design with three replicates.

1. Application of poultry manure as a top dressing.
2. Inorganic fertilizer as a Basal fertilizer and top dressing according to the Department of Agriculture (DOA) recommendation.

Usual cultivation practices adapted in broadcasting paddy cultivation was applied for all experimental plots. Seeds of the variety BG 358 were broadcasted in all plots. In 3 selected plots, all fertilizers were applied according to the DOA recommendations (Table 01). For other three plots only basal dressing was applied according to DOA recommendations and as a top dressing poultry manure was applied at the rate of 400Kg/ha in 3 split applications (Wickremaratna, *et al.*, 1992). Water level

was maintained up to panicle initiation.

Integrated pest management techniques (IPM) were used to reduce pest attack (Dayananda, 2004).

Table 01. Fertilizer application as DOA recommendation for intermediate zone.

	Basal (kg/ha)	Top dressing (kg/ha)		
		2WAB	5WAB	6WAB
Urea	12	72	120	48
TSP	84	00	00	00
MOP	35	00	00	00
TDM	00	00	00	142.5

(WAB- Weeks after Broadcasting)

The grain yield was measured at the physiological maturity stage of growth. The following yield parameters were recorded.

a) Number of panicle/m^2.
b) Number of grains/panicle.
c) Filled spikelet percentage.
d) Thousand grain weight.

Leaf area at 50% flowering was measured by using protable leaf area meter (Model ADCAM 100). Dry matter production was measured at 50% flowering and at harvesting stages. Pest and disease incidence was observed weekly. Soil samples were taken before treatment application and analyzed. Pooled t-test was used for data analyze.

RESULTS AND DISCUSSION

1. Analysis of yield components

Number of panicles per square meter, number of grains per panicle, filled spikelet percentage and thousand grain weight were not significantly different ($p>0.05$) between two treatments. Application of poultry manure gave positive changes in all parameters

2. Analysis of Yield and Growth parameters

According to analysis by pooled t-test, there was no significant difference between growth and yield parameters.

2.1. Yield

Table 02 shows that the plots treated with poultry manure gave higher yield (5008.6 kg/ha) than plots treated with inorganic fertilizer (4380 kg/ha). Both treatments were having higher yield than national average yield 3500kg/ha (Anon, 2004).

During study period, good plant density, higher number of tillers, deep root system and dark green colour leaves were observed in plots treated with poultry manure. Plants of the inorganic fertilizer treated plots were attacked by Brown Plant Hoppers (BPH) (*Nilaparvata lugens*) and paddy bug (*Leptocorisa acuta*). Further, they had lesser number of tillers and shallow root system compare to the plants from other treatment.

2.2 Analysis of growth parameters

Root dry weight was higher in plots treated with poultry manure than in plots treated with inorganic fertilizer (Table 02). When poultry manure was applied as a fertilizer, solubility of poultry manure and micro nutrient absorption by plants were high (Sirisena, 2004). As a result, well developed root system was produced.

3. Growth pattern

According to figure 01, there was no significant difference between two treatments, but higher growth rate was shown in plants of the poultry manure treated plots compare to plants of the inorganic fertilizer treated plots.

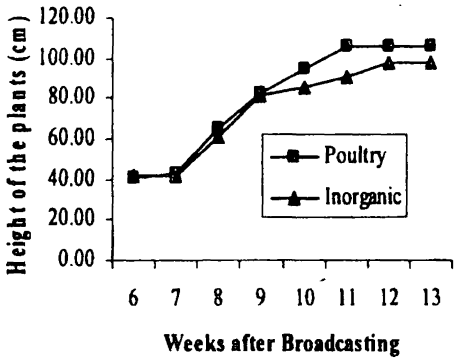

Figure 01. Growth pattern in height of paddy plants between poultry manure and inorganic fertilizer treatments.

4. Analysis of tiller count

According to figure 02, a steady and slow growth rate of tillers per hill was found up to 7 weeks in both treatments. After that, tiller count increased in the plots treated with poultry manure up to 10 weeks after broadcasting. Poultry manure gave better result compare to inorganic fertilizer. During a shorter period of time tiller count increased in inorganic treatments and gradually reduced in both treatments. Tillering ability is one of the most important traits of rice, which can have a significant influence on production of panicles (Miller *et al.*, 1991).

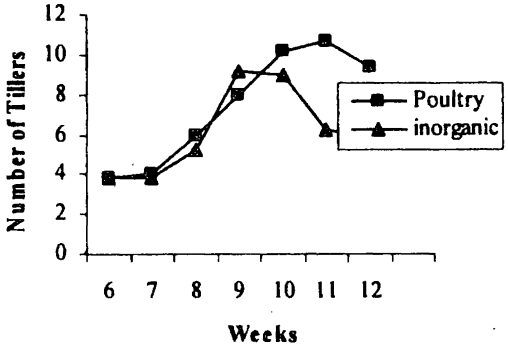

Figure 02. Number of tillers/hill under poultry manure and inorganic fertilizer treatments

5. Benefit and cost analysis

According to Table 03, total cost between poultry manure and inorganic fertilizer treatments were not significantly different, but Income gain was significantly different. Benefit Cost Ratio (BCR) of the Poultry manure treatment was higher (0.53) than inorganic fertilizer treatment (0.31). Due to the application of inorganic fertilizer as a top dressing, plants were attacked by brown plant hoppers ((*Nilaparvata lugens*)), Pesticide was used for all plots as a common treatment and higher expenses had to be spent.

Table 02. Stem dry weight, Root dry weight, Leaf dry weight, Leaf area at 50% flowering stage, Straw dry weight at harvesting stage and Yield of each treatment.

Treatments	Stem dry weight (g/bush)	Root dry weight (g/bush)	Leaf area (cm^2/bush)	Leaf dry weight (g/bush)	Straw dry weight (g/bush)	Yield (kg/ha)
Poultry manure	3.50	4.84	503.07	1.82	105.55	5008.6
Inorganic fertilizers	3.96	2.99	351.81	1.51	116.89	4380.0

Table 03. Benefit and Cost analysis of rice production under poultry manure and inorganic fertilizer treatments

Operation	Treatments (Rs/ha) Poultry	Inorganic
1st Land preparation	2,400.00	2,400.00
2nd Land preparation	2,400.00	2,400.00
Leveling	1,600.00	1,600.00
Seed paddy	2,400.00	2,400.00
Basal fertilizer	3,794.80	3,794.80
Top dressing organic	2,400.00	(-)
Top dressing inorganic	(-)	3,616.70
Weedicide	2,000.00	2,000.00
Pesticide	2,500.00	2,500.00
Labour cost	23,610.00	23,610.00
Harvesting/ Threshing	6,000.00	6,000.00
Total cost	49,104.80	50,321.50
Average yield (Kg/ha)	5,008.60	4,380.00
price of paddy (Rs/kg)	15.00	15.00
Income	75,129.00	65,700.00
Profit	26,024.20	15,378.50

6. Pest and diseases out break in each plot

BPH (*Nilaparvata lugens*) population was low in plots treated with Poultry manure (2/hill at heading stage of rice plant), while their population quickly increased in plots treated with inorganic (10/hill at heading stage). This supports the finding of Kajimura *et al.*, (1995) .The economic threshold level for BPH population is 5/hill at heading stage of rice plant (Anon, 2004). The rice plant is most sensitive to BPH attack at late vegetative and reproductive stages (Anon, 2004).

CONCLUSIONS

Both fertilizers had shown significant yield (5t/ha) increase over national average yield (3.5t/ha). However there was no significant difference in yield between poultry manure and inorganic fertilizer treatments. But total yield subjectively different in the terms of economic returns. Benefit Cost Ratio of Poultry manure treatment was higher (0.53) than inorganic fertilizer treatment (0.31). There was no any disease incidence found in the experimental plots. Due to the increase of BPH population in plots treated with inorganic fertilizer, pesticide was applied for all plots (both organic & inorganic plots). As a result cost of production had increased.

This experiment shows that there were valuable reasons to apply poultry manure as a top dressing in paddy cultivation. The recommendation of 400kg/ha of poultry manure for the Kandy district was taken for this experiment (Wickremaratna, *et. al.*, 1992)

so, further studies should be done in detail to make a justified recommendation for Kurunegala district.

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