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RESEARCH ARTICLE :

Effect of different organic source of manures on yield of white ponni

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SUMMARY : A field experiment was conducted at the Wetland farm, Department of Farm Management, Tamil Nadu Agricultural University, Coimbatore during *Samba* season (August, 2014 to January, 2015) to study the effect of different organic source of manures on yield of White ponni .The experiment was laid out in split plot design with three replications. The treatments at main plot consisted of different organic manures that were used *viz.*, no manure (M_1), FYM 5.0 t ha^{-1} (M_2), FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} (M_3) and FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1}(Vermicompost at two splits at active tillering (AT) (1.0t) and panicle initiation (PI) (1.0t) stages (M_4). The control plots did not receive any manure. In sub plots, different foliar sprays *viz.*, Water spray atAT and PI stages (S_1), PPFM (2%) atAT and PI stages (S_2) and TNAU *Panchakavya* (3%) atAT and PI stages (S_3) were sprayed. Higher grain and straw yield (4100 and 4825 kg ha^{-1}, respectively) were obtained under FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits at AT and PI stages) (M_4) and the yield under control (S_1) was (1856 and 2986 kg ha^{-1}, respectively). Combined application of organic manures and foliar spray recorded increased grain and straw yields *i.e.*,M_4S_3 (4278 and 5324 kg ha^{-1}, respectively).

KEY WORDS :
Organic manures, Foliar sprays, Organic rice, Yield

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BACKGROUND AND OBJECTIVES

Rice is the most important food crop accounting for 29 per cent of total calorie intake of the people of developing countries (FAO, 2001). The theme of the International Year of rice 2004 "Rice is life"-reflects the importance of rice as a primary food source, and is drawn from an understanding that rice-based systems are essential for food security, poverty alleviation and improved livelihoods. Rice (*Oryza sativa* L.) is an important and extensively cultivated food crop and feeds more than half of the world's population. In Asia alone, more than two billion people obtain 60 to 70 per cent of their energy intake from rice and its derivatives. India has the largest rice area among rice growing countries and it stands second in production next to China. Organic farming is gaining momentum in the recent past due to the farmer's movement, consumer's choice and promotion from the policy planners not only in India but also across the world. Growing awareness on health and

environmental issues in agriculture has demanded production of organic foods, which are emerging as an attractive source of rural income generation. (Bhattacharyya and Chakraborty, 2005). 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 to opt for non-chemical sources of plant nutrients like bio-fertilizers, *Azolla* and organic manures *viz*., farmyard manure, vermicompost, poultry manure and green manure. Awareness aboutsoil health and crop quality has led to an interest towards eco-friendly farming practice such as organic farming (Sharma *et al.*,2008). Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment. Rice is the major crop that utilises maximum quantity of fertilizers 40 per cent and pesticides to the tune of 17 to 18 per cent and these are the two major challenges in organic rice farming as nutrient management and pest management (Surekha *et al.*, 2012). The effect of complete exclusion of inorganic nutrient sources in rice nutrition needs to be studied in depth to make meaningful recommendation on organic nutrient management for rice. Keeping all the above aspects in mind, field experiments were carried out in riceto study the impact of organic manures onyield of medium duration organic rice.

Objectives:

– To study the effect of different organic source of manures on yield of White ponni.

– To find out the effect of organic foliar nutrition on organic rice.

RESOURCES AND METHODS

Field experiment was conducted at wetland farm of Tamil Nadu Agricultural University, Coimbatore during *Samba* season (August, 2014 to January, 2015).The soil of the experimental site revealed that the soil was slightly alkaline (pH = 8.02) with lowsoluble salts (EC = 0.42 dSm^{-1}), medium in organic carbon content (0.43%), low in available N (215.6 kg ha^{-1}), medium P (15.0 kg ha^{-1}) and high in K (470 kg ha^{-1}), respectively.The experiment was laid out insplit plotdesign with three replications. The treatments at main plot consisted of different organic manures that were used *viz.*, no manure (M_1), FYM 5.0 t ha^{-1} (M_2), FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} (M_3) and FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1}(Vermicompost at two splits at active tillering (AT) (1.0t) and panicle initiation (PI) (1.0t) stages (M_4). The control plots did not receive any manure. In sub plots, different foliar sprays *viz.*, Water spray atAT and PI stages (S_1), PPFM (2%) atAT and PI stages (S_2) and TNAU *Panchakavya* (3%) atAT and PI stages (S_3) were sprayed. The field was thoroughly ploughed with tractor and the Dhaincha [*Sesbania aculeata* Poir. (L.)], a leguminous green manure crop seeds were sown at a seed rate of 25 kg ha^{-1}. The green manure was cut and incorporated before transplanting of rice at the age of 43 days after sowing.The medium duration rice variety *viz.*, White ponni (135-140 days) was grown during *Samba* season. The seeds were sown at a seed rate of 40 kg ha^{-1} after treating with *Trichodermaviride* and *Pseudomonas fluorescence* at 10 g kg^{-1} of seeds and *Azospirillum* and phosphobacteria at 30 g kg^{-1} of seeds for raising nursery.Transplanting was done in the main field by conventional method with a spacing of 20 cm ×15 cm at two seedlings per hill. Based on required quantities of decomposed farm yard manure, vermicompost, *Neem* cake were incorporated in the soil one week before transplanting of rice. Dhaincha (*Sesbania aculeata)* green manure it is *insitu* incorporation common to all the treatment. Different sources of organic manures were applied as per the treatment schedule. The experimental plots were irrigated to two cm depth uniformly in all the treatments after the appearance of hair line cracks, upto panicle initiation stage. After panicle initiation, the plots were irrigated to 5 cm depth on disappearance of ponded water. Irrigation was stopped at 15 days prior to harvest. Hand weeding was done on 21st day after transplanting (DAT) which was followed by two hand weedings on 43rd and 63rd day to keep the field in weed free condition.*Neem* Seed Kernel Exract at 3 per cent was sprayed at 35 and 50DAT in order to keep leaf folder and stem borerpopulation below economic threshold level. Liquid formulation of *Pseudomonas fluorescence* at 500 ml ha^{-1} against the control of neck blast, leaf spot diseases and grain discoloration was given. For the rice crop, border rows were harvested first and the net plots were then harvested and threshed. Grain and straw yield (kg/ha) were calculated on the net plot basis.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Grain yield (kg ha^{-1}):

The data on grain yield are furnished in (Table 1 and Fig. 1). Grain yield was significantly influenced by the application of different organic sources of manures and foliar spray.The grain yield was influenced significantly by basal or top dressing by both the means of application of organic manures (FYM 5.0 t ha^{-1} / FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1}/ FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits atAT and PI stages) in addition to the *in situ* incorporation of green manure to a transplanted rice, varity White Ponni, cultivated during *'Samba'* season of Tamil Nadu. The rice grain yield was also influenced foliar application of organic growth promoter sprayed atAT and PI stages.

The impact of different organic manures on rice grain yield was independent and influenced by foliar sprays tested in this experiment (either PPFM 2% or TNAU *Panchakavya* (3%). Whereas the interaction effect of foliar sprays under a specific organic manure was significant.

The grain yield (Table 1) of rice increased significantly with the organics manures. Application of FYM 5.0 t ha^{-1} (M_2) over and above the green manure (M_1) improved the grain yield by 24.5 per cent (from 1797 to 2239 kg ha^{-1}). Addition of *Neem* cake 1.0 t ha^{-1} along with FYM 5.0 t ha^{-1} (M_3) enhanced the grain yield further by 30.5 per cent (from 2239 to 2922 kg ha^{-1}). Further addition by Vermicompost at 1 t ha^{-1} at AT and 1t ha^{-1} PI stages (M_4) boosted the grain yield by 40.3 per cent over M_3 (2922 to 4100kg ha^{-1}).

Higher rice grain yield obtained in the treatment combination of FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits at AT and PI stages) (M_4). Jagadeeshwar *et al*. (2012) reported that the application of vermicompost and Karanj cake could not only help to realise higher grain yield but also to minimize problem due to biotic stresses under organic rice cultivation. Similar results were obtained by Kenchaiah (1997). Singh *et al*. (2007) reported that rice grain yield registered under organic amendments was on par with the yield recorded under recommended dose of chemical fertilizer application.This might be due to the fact that steady and adequate supply of nutrients by the enhanced biochemical activity of micro-organisms coupled with large photosynthesizing surface would have helped in the production of more tillers and dry matter with enhanced supply of assimilates to sink resulting in more number of spikelet, higher filling percentage and higher yield.

Though the effect of foliar sprays was significant over water spray but this magnitude of impact were only

Table 1: Influence of organic source of nutrients on grain and straw yield (kg ha^{-1}) of organic rice

Treatments	Grain yield (kg ha^{-1})				Straw yield (kg ha^{-1})				Harvest index			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
M_1	1723	1813	1856	1797	2726	3026	3206	2986	0.39	0.41	0.42	0.41
M_2	2126	2278	2313	2239	3494	3685	3823	3667	0.40	0.40	0.40	0.40
M_3	2789	2976	3001	2922	4185	4262	4442	4296	0.40	0.40	0.40	0.40
M_4	3899	4123	4278	4100	4520	4631	5324	4825	0.43	0.42	0.41	0.42
Mean	2634	2798	2862		3731	3901	4199		0.41	0.41	0.41	
	S.E.±		C.D. (P=0.05)		S.E.±		C.D. (P=0.05)		S.E.±		C.D. (P=0.05)	
M	179.7		439.6		179.9		440.3		0.01		NS	
S	43.5		92.2		104.1		220.6		0.01		NS	
M at S	193.2		NS		247.5		NS		0.01		NS	
S at M	87.0		184.4		208.1		441.2		0.01		NS	

Main plot
M_1-No manure
M_2-FYM 5.0 t ha^{-1}
M_3 - FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1}
M_4 - FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits at AT (1.0t) and PI (1.0t) stages)
Note: AT –Active Tillering stage; PI- Panicle Initiation stage

Sub plot
S_1 – Water spray at AT and PI
S_2 – PPFM (2%) at AT and PI
S_3 – TNAU *Panchakavya* (3%) at AT and PI
NS= Non-significant

6.2 per cent and 8.7 per cent for PPFM 2 per cent and TNAU *Panchakavya* (3%), respectively. Combined application of organic manures and foliar spray recorded increased grain and straw yields *i.e.*,M_4S_3 (4278 and 5324 kg ha^{-1}, respectively).

Straw yield of rice :

Regarding all straw yield (Table 1 and Fig. 1), application of FYM 5.0 t ha^{-1} (M_2) over and above the green manure (M_1) improved the grain yield by 22.8 per cent (from 2986 to 3667 kg ha^{-1}). Addition of *Neem* cake 1.0 t ha^{-1}along with FYM 5.0 t ha^{-1}(M_3) enhancedthe straw yield further by 17.1 per cent (from 3667 to 4296 kg ha^{-1}). Further addition by Vermicompost at 1 t ha^{-1} at AT and 1 t ha^{-1} PI stages (M_4) boosted the straw yield by 12.3 per cent over M_3 (4296 to 4825kg ha^{-1}).

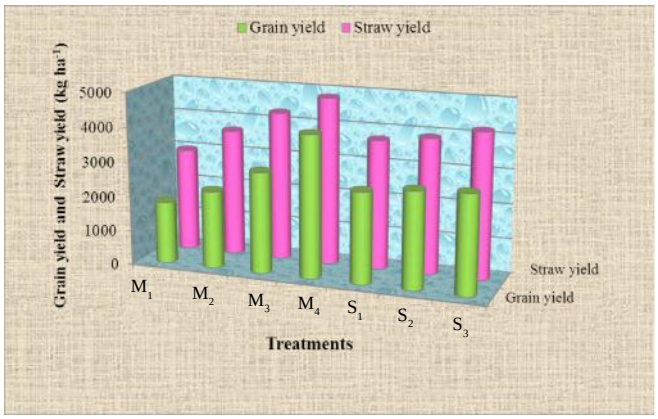

Fig. 1 : Grain yield and straw (kg/ha^{-1}) as influenced by organic manures and foliar spray in organic rice

FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits at AT and PI stages) (M_4) enhanced the straw yield and which was superior over FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} (M_3). All the treatments were superior over control. This might be due to the fact that adequate biomass production, more number of tillers and better nutrient uptake which might have resulted in higher straw yield in these treatments. This is in accordance with the results obtained by Yadav and Lourduraj (2006).

Though the effect of foliar sprays was significant over water spray but this magnitude of impact were only 4.6 per cent and 7.6 per cent for PPFM 2 per cent and TNAU *Panchakavya* (3%), respectively. Joined application of organic manures and foliar spray recorded increased straw yields *i.e.*, M_4S_3 (5324 kg ha^{-1}, respectively).

Harvest index :

Higher harvest index (HI) (Table 1) was recorded in the treatment FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits at AT and PI stages) (M_4) followed by FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} (M_3) (0.42 and 0.40) whereas, the control recorded the lowest. The positive improvement in harvest index could be described to the increased filled grains per unit area.

Conclusion :

The normal recommended dose of FYM 12.5 t ha^{-1} is reduced to 5.0 t ha^{-1} and other source of organic manure is used to achieve higher yield in White ponni. *In situ* green manuring with *Sesbania aculeate* followed by FYM 5.0 t ha^{-1} + *Neem* cake 1.0 t ha^{-1} + Vermicompost 2.0 t ha^{-1} (Vermicompost at two splits at AT and PI stages) + TNAU *Panchakavya* (3%) has resulted in increased yield with improvement of soil chemical and biological properties.

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