

Evaluation of organic manures for sustaining productivity in groundnut-rice cropping system

MS TALATHI and UV MAHADKAR*

Krishi Vigyan Kendra, Killa-Roha, Raigad 410201 MS, India

***Department of Agronomy**

Dr BS Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri 415712 MS, India

Email for correspondence: manoj84048@yahoo.co.in

ABSTRACT

Groundnut-rice is a very popular cropping sequence adopted by the farmers in Konkan region due to favorable climatic conditions. The nutrient management plays a dominant role in increasing the productivity as well as maintaining the soil health. The study was conducted to evaluate the effect of different organic manures in groundnut-rice cropping system. Field experiments were conducted at Agronomy Farm, College of Agriculture, Dapoli during 2006-2009. Continuous application of organic manures over a period of three years in groundnut-rice cropping system did not show any improvement in the available nutrients. On the contrary it resulted in the net negative balance of available N from 22.8 kg (lowest due to poultry manure) to 91.8 kg N/ha (highest in unfertilized plot) over initial soil fertility. In general all the organic manures resulted in negative balance of available potassium in groundnut-rice cropping system.

Keywords: Groundnut; rice; cropping system; nutrient management

INTRODUCTION

The soil nutrient reserves deplete by heavy crop removal if not adequately replenished by way of fertilization and manuring. It would slowly lead to deterioration of soil's productive capacity (Reddy 2004). Increasing cropping intensity and enhanced productivity levels step up the nutrient removal by crop harvest. Organic manures not only regularly supply macro, micro and secondary nutrients but also

improve soil physical properties and soil biological health (Singh 2001). Groundnut-rice is a very popular cropping sequence adopted by the farmers in Konkan region due to favorable climatic conditions. The nutrient management plays a dominant role in increasing the productivity as well as maintaining the soil health. The study was conducted to evaluate the effect of different organic manures in groundnut-rice cropping system at Agronomy Farm, College of Agriculture, Dapoli during 2006-2009.

MATERIAL and METHODS

Field experiments were conducted at Agronomy Farm, College of Agriculture, Dapoli during 2006-2009. The soil was clay loam with slight in reaction (pH 6.33), very high in organic carbon (1.43%), medium in available N (300.9 kg/ha) and low in available P_2O_5 (16.9 kg/ha) and available K_2O (158.3 kg/ha). Groundnut crop was grown in Rabi season in randomized block design consisting of nine treatments with three replications. All organic manures were applied @ 5 tons/ha. A low density white transparent polythene film of 7 micron thickness with 90 cm width was spread on flat beds. The edges of sheet were burried on both the sides of bed. The treated seeds of (Thiram @ 3 g/kg) groundnut variety TG-26 were used for sowing. Holes of 3 cm depth were made on polythene film with machine and the seeds were dibbled at 30 x 10 cm spacing @ 2 seeds per hole covering with moist soil. Split plot design was used for rice grown during Kharif season to test the residue of organic manures with two levels of 100 per cent RDF (100:50:50 kg NPK/ha) and 50 per cent RDF (50:25:25 kg NPK/ha). Nitrogen was applied in three splits while phosphorus and potash were given as basal dose. Rice cv Palghar 1 was transplanted using 25 days old seedlings at a spacing 20 x 15 cm. Soil samples were taken from each plot in the beginning and at the end of each cropping season. The samples were analyzed by using standard procedures.

Need based plant protection measures were followed. Standard statistical procedures given by Panse and Sukhatme (1967) were used.

RESULTS and DISCUSSION

Data indicated that application of Swastik, RDF and phosphocompost recorded significantly higher pod yield compared to FYM, Bhoomilabh, Celrich, vermicompost and control. These treatments recorded 46.73, 45.93 and 44.54 q/ha yield which were 59.2, 56.4 and 51.7 per cent higher over control respectively while the differences between former three treatments were of the similar magnitude. Similarly poultry manure and FYM also showed their superiority over Bhoomilabh, Celrich, vermicompost and control. Later three treatments showed their superiority over control but the differences between them were of the similar order. Similar trend was also noticed in case of haulm yield. The differences between Swastik, RDF, phosphocompost, poultry manure were not up to the mark though these treatments were superior than Bhoomilabh, Celrich, vermicompost and control.

The direct effect of 100 per cent RDF (43.77 q/ha) was significant in increasing the grain yield of rice as compared to 50 per cent RDF (37.09 q/ha). It was observed that the residual effects of all the organic manures showed beneficial

Table 1. Groundnut pod and haulm/grain yield of rice and fertility dynamics in groundnut-rice cropping system as affected by different treatments (average of three years)

Treatment	Groundnut yield (q/ha)		Grain yield rice (q/ha)				Available N (kg/ha)		Available P (kg/ha)		Available K (kg/ha)	
	Pod	Haulm	100% RDF	50% RDF	Mean RDF		AHG	AHR	AHG	AHR	AHG	AHR
. YM	41.65	47.91	43.40	42.16	42.78		282.7 (-18.2)	278.8 (-22.1)	11.5 (-5.4)	10.6 (-6.3)	152.5 (-5.8)	144.1 (-14.2)
Poultry manure	43.68	49.32	50.26	42.99	46.62		295.2 (-5.7)	283.8 (-17.1)	19.3 (2.4)	14.9 (-2.0)	163.8 (5.5)	150.4 (-7.9)
Vermicompost	37.27	44.24	44.30	39.70	42.00		283.2 (-17.7)	272.4 (-28.5)	13.8 (-3.1)	10.8 (-6.1)	154.7 (-3.6)	143.5 (-14.8)
Celrich	38.78	44.86	40.51	38.37	39.44		279.9 (-21.0)	269.2 (-31.7)	11.7 (-5.2)	9.6 (-7.3)	152.2 (-6.1)	139.9 (-18.4)
Swastik	46.73	53.21	48.64	39.82	44.23		294.6 (-6.3)	283.3 (-17.6)	21.7 (4.8)	12.1 (-4.8)	162.4 (4.1)	147.4 (-10.9)
Bhoomilabh	39.25	45.51	47.42	38.76	43.09		289.8 (-11.1)	274.5 (-26.4)	20.8 (3.9)	13.5 (-3.4)	161.3 (3.0)	147.2 (-11.1)
RDF	45.93	52.94	45.84	36.01	40.92		286.3 (-14.6)	274.4 (-26.5)	21.3 4.4)	11.1 (-5.8)	155.8 (-2.5)	142.2 (-16.1)
Control	29.36	36.03	33.48	27.49	30.48		259.7 (-41.2)	250.3 (-50.6)	8.5 (-8.4)	7.0 (-9.9)	138.6 (-19.7)	128.9 (-29.4)
Phospho- compost	44.54	51.13	40.10	34.68	37.39		278.7 (-22.2)	271.7 (-29.2)	31.3 (14.4)	24.4 (7.5)	147.9 (-10.4)	140.3 (-18.0)
CD _{0.05}	2.85	4.29	2.40	4.38	—		—	—	—	—	—	—
Initial value (kg/ha)	—	—	—	—	—		300.9	—	16.9	—	158.3	—

Figures in parentheses indicate gain or loss of nutrient, AHG= After harvest of groundnut, AHR= After harvest of rice

effects in increasing the rice grain yield over control. In general poultry manure showed marked residue and increased the grain yield of rice significantly compared to all the remaining treatments. Similarly Swastik, Bhoomilabh, FYM and vermicompost were superior to Celrich, Phosphocompost and control but the differences due to residue between former four treatments were not significant.

Data on available nitrogen after groundnut indicated negative balance due to all the organic manures. The extent of loss of available N was the highest in control/unfertilized plots (41.2 kg N/ha) followed by Phosphocompost (22.2 kg N/ha), Celrich (21.0 kg N/ha) and FYM (18.2 kg N/ha) while the lowest loss was observed due to poultry manure (5.7 kg N/ha) and Swastik (6.3 kg N/ha) over the initial soil fertility. This trend continued even after the harvest of rice. The loss was aggravated in control (50.6 kg N/ha) followed by Phosphocompost (29.2 kg N/ha), vermicompost (28.5 kg N/ha), RDF (26.5 kg N/ha), Bhoomilabh (26.4 kg N/ha) and FYM (22.1 kg N/ha). The continuous application of organic manures did not show any build up in available nutrients. The net negative balance of available N in groundnut-rice cropping system was the highest due to unfertilized treatment (91.8 kg N/ha) followed by Celrich (52.7 kg N/ha), Phosphocompost (51.4 kg N/ha), vermicompost (46.2 kg N/ha), RDF (41.6 kg N/ha) and FYM (40.3 kg N/ha) while

the extent of loss of N was less due to poultry manure (22.8 kg N/ha) and Swastik (23.9 kg N/ha) application.

Application of Phosphocompost resulted in build up of available phosphorus (14.4 kg P_2O_5 /ha) followed by Swastik (4.8 kg P_2O_5 /ha), RDF (4.4 kg P_2O_5 /ha), Bhoomilabh (3.9 kg P_2O_5 /ha) and poultry manure (2.4 kg P_2O_5 /ha) while remaining manures did not show positive balance for available phosphorus after groundnut. On the other hand Phosphocompost resulted into buildup of available phosphorus by 7.5 kg P_2O_5 /ha after rice. Data indicated that continuous application of organic manures alone did not maintain soil health in groundnut-rice cropping system resulting in negative balance of available soil phosphorus.

The available potassium balance was not improved due to different organic manures except poultry manure (5.5 kg K_2O /ha), Swastik (4.1 K_2O /ha) and Bhoomilabh (3.0 K_2O /ha) after harvest of groundnut. On the contrary different organic manures showed negative balance of potassium after harvest of rice except Phosphocompost.

CONCLUSION

Amongst the different organic manures Swastik, Phosphocompost, poultry manure and FYM each @ 5 tons/ha were found efficient for groundnut.

Application of poultry manure, Swastik, Bhoomilabh, FYM and vermicompost showed marked residue benefiting the succeeding rice crop in groundnut-rice cropping system. Continuous application of organic manures over a period of three years in groundnut-rice cropping system did not show any improvement in the available nutrients. On the contrary it resulted into net negative balance of available N from 22.8 kg (lowest due to poultry manure) to 91.8 kg N/ha (highest in unfertilized plots) over initial soil fertility. Phosphocompost enhanced the available phosphorus in soil after groundnut to the extent of 14.4 kg/ha while other remaining manures showed negative balance of phosphorus. Continuous application of organic manures did not improve the fertility status in groundnut-rice

cropping system except Phosphocompost. Similar results were also observed in available potash, except poultry manure, Swastik and Bhoomilabh. In general all the organic manures resulted in negative balance of available potassium in groundnut-rice cropping system.

REFERENCES

- Panse VG and Sukhatme PV 1967. Statistical method for agricultural workers. ICAR, New Delhi, India, pp199-200.
- Reddy D 2004. Soil fertility and fertilizer use situation in India. Paper presented in Short Training Course on Assessment of Compost Quality for Agriculture Crop Production, Bhopal, MP, India, pp 9.
- Singh P 2001. Sustainable crop production—limitations and strategies. Indian Farming, January 2001, pp 7-10.

Received: 7.3.2015

Accepted: 12.7.2015