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Effect of organic manures on productivity of finger millet and redgram inter cropping system under protective irrigation

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ABSTRACT

A Field experiment was conducted at University of Agricultural Sciences, Bangalore, Karnataka, India during *Kharif* seasons of 2006 and 2007. The soil of experimental site was red sandy loam and clay loam in texture with slightly acidic in nature. The experiment was laid out in Randomized Block Design with four replications and seven treatments comprised of different organic sources such as FYM, sewage sludge, poultry manure compost, urban garbage compost, vermicompost and enriched urban garbage compost and they were applied at the rate equivalent to recommended nitrogen and were compared with recommended inorganic fertilizers to study the response of Ragi + Redgram intercropping system under protective irrigation. Application of either sewage sludge or poultry manure compost produced significantly higher grain yield (2498 and 2475 kg ha^{-1}, respectively) and straw yield of finger millet (4065 and 4009 kg ha^{-1}, respectively) and redgram grain and stalk yield (370 and 355 kg ha^{-1}, respectively). The study clearly revealed that sewage sludge and poultry manure compost application at equivalent recommended nitrogen dose could be successfully used for fingermillet and redgram intercropping system to substitute the chemical fertilizers and found to be sustainable.

Key words : Finger millet, Redgram, Organic manures, Protective irrigation and yield, Intercropping

INTRODUCTION

In recent energy crisis, hike in the prices of the inorganic fertilizers and declining soil health and productivity necessitate the use of organic manures compulsorily in agricultural crop production.The continuous use of inorganic fertilizers under intensive cropping system has caused widespread deficiency of secondary and micronutrients in soil (Anonymous, 2005). Ragi + redgram intercropping system (8 :2) under rainfed condition is a common practices in southern Karnataka. It can be evaluated as an additive intercrop redgram would increase the productivity of soil and cropping system besides helps to supply protein to the farmers. The research evidences conspicuously indicated that the yield advantages are possible through protective irrigation in inter cropping over sole cropping. It is necessary to manage the soil moisture through protective irrigation. Although the millet crops are reported to be most tolerant to moisture stress but even for short period of moisture stress during critical stages of growth, markedly reduces the yield (Udayakumar *et al.*, 1986). The information on sustainable productivity of finger millet and redgram with use of organic manures in finger millet based intercropping system is essential.

MATERIALS AND METHODS

Field experiment was conducted during the *Kharif* season of 2006 and 2007 at Gandhi Krishi Vignana Kendra, University of Agricultural Sciences, Bangalore. The soil of the experimental site was red sandy loam in texture classified under the order *Alfisols*, Vijaipura series, isohyperthermic family of *oxihaplustaf*. pH was slightly acidic (6.44) having low cation exchange capacity (7.50 C mol kg^{-1}) with an electrical conductivity of 0.23 dSm^{-1}. The organic carbon content was low with 0.47 per cent. The soil was low in available nitrogen (202.8 kg ha^{-1}), high in available phosphorus (26.2 kg ha^{-1}) and medium in available potassium (217.10 kg ha^{-1}). The experiment was conducted in Randomized Complete Block Design with four replications to study the response of finger millet + redgram intercropping system under protective irrigation condition as influenced by different organic sources. Seven treatments comprised of different organic sources such as FYM, sewage sludge, poultry manure compost, urban garbage compost, vermicompost and enriched urban garbage compost were applied at the rate equivalent to recommended nitrogen basis and then compared with the recommended inorganic fertilizers. Yield and yield attributes were recorded at harvest in both the crops. Protective irrigation was given thrice to the crop based on the availability and economics of intercropping systems were worked out based on prevailing market price of product.

RESULTS AND DISCUSSION

The results obtained from the present investigation

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have been discussed in the following sub heads :

Yield attributing characters of finger millet:

Among organic manures application of either sewage sludge (equivalent to 50 kg N) or poultry manure compost produced maximum yield components *viz*., number of productive tillers plant^{-1} (7.13 and 6.93), number of fingers ear^{-1} (8.33 and 8.08), grain yield plant^{-1} (12.53 and 12.25 g) and 1000 grain weight (3.71 and 3.66 g) (Table 1). Improvement in yield attributes was due to higher concentration of macro and micronutrients added to soil in the form of sewage sludge / poultry manure resulting in increased availability of nutrients in root zone, thus more uptake by crop resulting in higher values of yield attributing characters. These results conform the result of Poornesh *et al.* (2004). This could be attributed to higher concentration of nutrients in sewage sludge and faster mineralization (Anand, 1995), improvement in soil physico-chemical and biological properties by using sewage sludge or poultry manure (Jha *et al*., 2001).

Grain and straw yield of finger millet:

Significant differences were observed in yield of both grain and straw of finger millet. Application of sewage sludge (equivalent to 50 kg N) produced higher finger millet grain and straw yield (2498 and 4065 kg ha^{-1}, respectively) followed by poultry manure compost (2475 and 4009 kg ha^{-1}, respectively).While lowest was obtained with the application of FYM (1934 kg ha^{-1} 3307 kg ha^{-1}, respectively) (Table 1). This was attributed to higher growth and yield attributing characters in turn improvement in these characters was due to synergistic effect of organic manures resulting in release of nutrients which was in synchrony with crop demand at different growth stages. This was also attributed to the slow and steady rate of nutrient release into soil solution to match the required absorption pattern of fingermillet. Earlier work conducted by Devagowda (1997) and Dosani *et al*. (1999) have also reported similar results.

Grain and stalk yield of redgram:

Application of sewage sludge obtained significantly higher redgram grain yield (370 kg ha^{-1}) followed by poultry manure compost (355 kg ha^{-1}) (Table 2). However, lowest grain yield was recorded with the application of FYM (263 kg ha^{-1}). Similarly, stalk yield of redgram significantly increased with the application of sewage sludge (1407 kg ha^{-1}) and poultry manure compost over FYM (1021 kg ha^{-1}) (Table 2). The higher seed and stalk yield components in redgram can also be traced back to higher yield components during different growth stages with the application of sewage sludge and poultry manure compost. Higher redgram grain yield with sewage sludge application may be due to difference in number of pods per plant (83.0) and grain yield per plant (39.7 g). The variation in grain yield per plant was mainly due to differences in 100 grain weight (12.6 g) as compared to FYM and recommended dose of fertilizers. It was followed by poultry manure compost (81.0, 38.1 g and 12.4 plant^{-1}, respectively).The significant increase in yield components with application of sewage sludge and poultry manure compost might be attributed to beneficial effect of organic manure on physical, chemical and biological properties of soil, besides supplying essential nutrients to

Table 1 : Effect of different organic sources of nutrients on yield and its attributes at harvest of finger millet main crop in intercropping system. (Data pooled over two years)

Treatments	Number of productive tillers plant^{-1}	Number of fingers ear^{-1}	Finger length (cm)	Grain yield plant $^{-1}$ (g)	1000-grain weight(g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index
Recommended NPK	5.83	6.95	7.02	9.77	3.22	2045	3293	0.38
Farm yard manure	5.75	6.44	6.73	9.34	3.18	1934	3307	0.37
Urban garbage compost	5.85	6.65	6.88	9.61	3.21	2019	3395	0.37
Sewage sludge	7.13	8.33	8.93	12.53	3.71	2498	4065	0.39
Poultry manure compost	6.93	8.08	8.70	12.25	3.66	2475	4009	0.39
Enriched urban garbage compost	6.53	7.58	8.22	11.51	3.44	2337	3769	0.38
Vermicompost	6.38	7.48	8.11	11.12	3.41	2305	3702	0.38
S.E $\pm$	0.16	0.21	0.18	0.27	0.07	51.7	83.7	0.02
C.D. (P=0.05)	0.48	0.63	0.54	0.79	0.21	155.1	251.1	NS

Note: Organic manures used were equivalent to recommended dose of 50 kg nitrogen ha^{-1}

Table 2 : Effect of different organic sources of nutrients on yield and its yield attributes of red gram intercrop (Data pooled over two years)

Treatments	Number pods plant^{-1}	Dry weight of pods plant^{-1} (g)	Grain yield plant^{-1} (g)	100 grain weight(g)	Grain yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Harvest index
Recommended NPK	70.3	53.4	30.8	11.9	295	1137	0.206
Farm yard manure	63.4	48.5	28.3	11.6	263	1021	0.205
Urban garbage compost	65.5	53.1	30.2	11.7	282	1095	0.205
Sewage sludge	83.0	75.1	39.7	12.6	370	1407	0.208
Poultry manure compost	81.0	71.4	38.1	12.4	355	1350	0.208
Enriched urban garbage compost	77.3	66.4	36.0	12.2	335	1287	0.207
Vermicompost	74.9	63.2	34.6	12.1	322	1239	0.207
S.E. $\pm$	2.93	2.58	0.76	0.33	7.63	29.83	0.003
C.D. (P=0.05)	8.79	7.74	2.26	NS	22.85	89.46	NS

Note: Organic manures used were equivalent to recommended dose of 50 kg nitrogen ha^{-1}

plant growth. This also could be attributed to ability of plants to absorb the required nutrients as per its demand resulting in better yield components and grain yield of redgram. The synchrony of improved plant nutrient release and its availability had a profound influence on crop yield. Similar results of higher yield were obtained by Umesh (2006) in finermillet with redram intercrop; Kumar (2006) in soybean.This was due to the ability of sewage sludge and poultry manure compost to satisfy the nutrient demand of crop more efficiently than other manures in finger millet + redgram intercropping system. It can be concluded from this study that application of sewage sludge and poultry manure compost was superior over all other treatments by giving higher grain yield and satisfied the nutrient demand of crop more efficiently than the other manures in finger millet + redgram intercropping system.

REFERENCES

Anand, A.S. (1995). Characterization and utilization of sewage and industrial sludge for crop production. M.Sc (Ag.) Thesis, University of Agricultural Sciences, Bangalore (Karnataka).

Anonymous (2005). Annual Report on Area, Production, Productivity and Prices of agricultural crops in Karnataka, Directorate of Economics and Statistics Bangalore, pp: 35-38.

Devegowd, A.G. (1997). Poultry manure excreta and other wastes as a source organic manures. *In*:Training course on organic farming, University of Agricultural Sciences, GKVK, Bangalore, pp: 7-11.

Dosani, A.A.K., Talashikar, S. and Mehta, V.B. (1999). Effect of poultry manure applied in combination with fertilizers on the yield, quality and nutrient uptake of groundnut. *J. Indian Soc. Soil Sci.,* **47**(1): 166-169.

Jha, S.K., Sharma, A. and Singh, R.P. (2001). Characterization of farm and city waste manures of diverse origin. *J. Res.*, **13** (2): 117-123.

Kumar, Dinesh (2006). Integrated nutrient management for fingermillet-soybean and soybean- fingermillet cropping system. Ph.D. Thesis, University of Agricultural Sciences, Bangalore (Karnataka).

Poornesh, A.S., Reddy, V.C. and Kalyanamurthy, K.N. (2004). Effect of urban garbage compost and sewage sludge on yield of ragi [*Eleusine coracana* (L.) Gaertn] and soil properties. *Environ. & Ecol.*, **22** (3): 720-723.

Udayakumar, M., Sashidhar, V. R. and Prasad, T.G. (1986). Physiological approaches for improving productivity of finger millet under rainfed conditions. In :Paper presented at the International Workshop on Small Millets. Oct. 26th Nov. 2, 1986, University of Agricultural Sciences, Bangalore (Karnataka).

Umesh, M.R, Sharanappa and Jagadeesha, N. (2006). Growth, yield and nutrient uptake of finger millet as influenced different cropping systems and fertility levels. National seminar on resource management for sustainable agriculture, Annamalai University, Annamalai Nagar. pp-345.

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