Madras Agric. J. 89 (10-12) : 613-616 October-December 2002
https://doi.org/10.29321/MAJ.10.A00272

Effect of vermicompost on growth and yield of soybean (*Glycine max* L.) cv. CO 1

K. THANUNATHAN, K. ARULMURUGAN, G. KUPPUSWAMY AND M. RAVICHANDRAN
Faculty of Agriculture, Annamalai University, Annamalai Nagar - 608 002, Tamil Nadu.

Abstract: Field experiments were conducted to study the effect of vermicompost on growth and yield of soybean (*Glycine max* L.) cv. CO 1 at Annamalai University Experimental Farm, Annamiali Nagar. Locally, freely and easily available agricultural wastes like sugarcane trash and coirpith were used for compost preparation using earthworm (*Euridilus eugeniae*) and they were compared with well decomposed farm yard manure application. Enriched organic manure was prepared using 750 kg organic manure ha^{-1} and the entire quantity of P_2O_5 (80 kg ha^{-1}), 30 days prior to application. There were twelve treatments comprising of three organic sources *viz.* well decomposed FYM, coirpith vermicompost and sugarcane trash vermicompost at four levels *viz.* 12.5 t ha^{-1}, 10.0 t ha^{-1}, 7.5 t ha^{-1} and 750 kg ha^{-1} in enriched form. It was observed that when compared to FYM application at different levels, the growth character, yield attributes and yield of soyben were favourably influenced by the application of vermicompost at different levels. Higher growth, nodulation and yield values were recorded when vermicomposts were applied at 12.5 t ha^{-1} and 750 kg ha^{-1} in enriched form.

Key words : Soybean, Vermicompost, FYM.

Introduction

Soybean has multiplicity of uses as pulses, oilseeds, and in the preparation of nutritionally balanced food stuff. It has great demand all over the world. Hence, there is a pressing need to increase area and production of soybean.

Continuous use of high analysis fertilizers, improved varieties and plant protection chemicals cause several hazards to soil health by heavy withdrawal of nutrients, nutrient imbalance and ultimately resulting in the reduction of crop yield. Application of organic manures alone or in combination with inorganic fertilizers help both in providing better nutrients to the crop plants and maintaining soil fertility. Non-availability of sufficient organic manures focused the need for effective use of organic refuse. Farmers usually destory the locally available crop residues like sugarcane trash by buring. The disposal of coirpith in coir industry is a problem because farmers cannot use it as such for field crops. Kale *et al.* (1982; 1988) reported that the breakdown of these materials is enhanced in the presence of earthworms which is known as Vermicomposting. Lee (1985) also reported that the soil health could be maintained by applying vermicompost. The knowledge about the effect of vermicompost on field crops is very meager. An experiment was therefore conducted to study the feasibility of organic recyclying of crop residues like sugarcane trash and coirpith by vermicomposting and reducing the quantity of organic manure application by enriched manure.

Materials and Methods

A field experiment was conducted during 1994-95 and 1995-96 at Annamalai University Experimental Farm, Annamalai Nagar. The soil of the experimental field was clay loam in texture having pH 8.20, EC 0.48 dSm^{-1}, low in available N (198 kg ha^{-1}), medium in available P (19 kg ha^{-1}) and high in available K (420 kg ha^{-1}). The experiment had twelve treatments comprising three organic sources *viz.* FYM, vermicomposted coirpith and vermicomposted sugarcane trash at four levels *viz.* 12.5 t ha^{-1}, 10.0 t ha^{-1}, 7.5 t ha^{-1} and 750 kg ha^{-1} in enriched form. The treatments were individually tested in randomised block design with three replications. Vermicomposting was done by the method suggested by Bano and Kale (1989). In case of enriched manure application, the organic manure @ 750 kg ha^{-1} each enriched with entire quantity of P_2O_5 (80 kg ha^{-1}) and

Table 1. Effect of different organic manures on growth characters of soybean

Treatments		Plant height at harvest (cm)		LAI at flowering		No.of effective nodules plant^{-1}	
		Season I	Season II	Season I	Season II	Season I	Season II
T_1	FYM @ 12.5 t ha^{-1} (control)	68.30	68.03	4.82	4.98	19.31	20.39
T_2	Coirpith vermicompost @ 12.5 t ha^{-1}	75.43	76.00	5.64	5.87	23.64	24.62
T_3	Sugarcane trash vermi compost @ 12.5 t ha^{-1}	73.30	74.20	5.54	5.72	23.20	24.42
T_4	FYM @ 10.0 t ha^{-1}	62.66	63.13	4.60	4.45	18.43	19.66
T_5	Coirpith vermicopost @ 10.0 t ha^{-1}	70.92	72.33	5.47	5.62	20.89	22.29
T_6	Sugarcane trash vermi-compost @ 10.0 t ha^{-1}	68.00	71.10	5.05	5.00	20.79	21.91
T_7	FYM @ 7.5 t ha^{-1}	56.43	60.33	3.97	3.64	13.44	14.50
T_8	Coirpith vermicompost @ 7.5 t ha^{-1}	67.00	65.20	4.82	4.82	16.44	18.63
T_9	Sugarcane trash vermi-compost @ 7.5 t ha^{-1}	65.33	63.20	4.34	4.17	15.50	15.80
T_{10}	Enriched FYM @ 750 kg ha^{-1}	69.40	68.36	5.37	5.52	20.66	22.00
T_{11}	Enriched coirpith vermi-compost @ 750 kg ha^{-1}	74.00	74.36	5.61	5.81	23.46	24.47
T_{12}	Enriched sugarcane trash vermicompost @ 750 kg ha^{-1}	78.10	73.50	5.53	5.66	21.70	22.51
	CD (P=0.05)	2.65	2.16	0.26	0.25	0.71	0.50

kept for 30 days before application. The data pertaining to growth, nodulation and yield parameters were recorded.

Results and Dicussions

Growth attributes

Vermicompost application increased the growth attributes such as plant height and leaf area index (Table 1). Maximum values were recorded in coirpith vermicompost application @ 12.5 t ha^{-1}. Increased plant height and LAI in the present investigation might be due to reduced loss of N, increased nutrient content and uptake. Increased growth and reduced loss of N due to vermicompost application were reported by Grapelli *et al.* (1985) and Kale *et al.* (1992).

Nodulation

When compared to FYM application, vermicompost application significantly increased the effective nodules per plant (Table 1). Higher and similar effective nodule number per plant was recorded when coirpith and sugarcane trash vermicomposts were applied at 12.5 t ha^{-1} and 750 kg ha^{-1} coirpith vermicompost in enriched form. Kale *et al.* (1992) reported that the colonization of mycorrhizae, N_2 fixers and phosphate solubilizing actinomycetes were increased when vermicompost was applied. This might be the reason for increased nodulation with vemicompost and enriched vermicompost application.

Table 2. Effect of different organic manures on yield attributes and yield of soybean

Treatments		No. of pods/ plant		No. of seeds/ pod		100 seed weight (g)		Grain yield (kg ha^{-1})	
		Season I	Season II	Season I	Season II	Season I	Season II	Season I	Season II
T1	FYM @ 12.5 t ha^{-1} (control)	38.73	38.43	2.52	2.56	11.22	11.23	1354.4	1309.3
T2	Coirpith vermicompost @ 12.5 t ha^{-1}	44.59	45.08	2.65	2.66	12.32	12.00	1455.6	1432.0
T3	Sugarcane trash vericompost @ 12.5 t ha^{-1}	43.96	44.32	2.62	2.63	11.91	11.56	1447.3	1427.3
T4	FYM @ 10.0 t ha^{-1}	33.61	34.60	2.32	2.46	10.68	10.93	1291.3	1280.3
T5	Coirpith vermicompost @ 10.0 t ha^{-1}	44.17	43.54	2.58	2.62	11.79	11.36	1428.3	1400.0
T6	Sugarcane trash vermicompost @ 10.0 t ha^{-1}	40.40	42.53	2.58	2.62	11.74	11.30	1420.3	1398.2
T7	FYM @ 7.5 t ha^{-1}	31.51	30.48	2.08	2.26	10.25	10.60	1205.3	1180.6
T8	Coirpith vermicompost @ 7.5 t ha^{-1}	37.28	37.54	2.44	2.49	11.06	11.10	1301.3	1302.6
T9	Sugarcane trash vermicompost @ 7.5 t ha^{-1}	32.65	32.45	2.26	2.43	10.68	10.16	1291.3	1287.6
T10	Enriched FYM @ 750 kg ha^{-1}	39.54	39.22	2.55	2.60	11.40	11.26	1350.6	1341.3
T11	Enriched coirpith vermicompost @ 750 kg ha^{-1}	44.31	44.47	2.63	2.65	11.99	11.66	1449.3	1429.0
T12	Enriched sugarcane trash vermicompost @ 750 kg ha^{-1}	46.54	43.59	2.61	2.63	11.89	11.59	1448.6	1414.8
	CD (P=0.05)	0.90	1.22	0.05	0.03	0.50	0.46	10.1	17.2

Yield attributes and yield

Vermicompost application showed a marked influence on the yield attributes, ultimately resulting in increased yield. The vermicompost application produced more grain yield than the respective levels of FYM in both seasons (Table 2). Maximum grain yield was recorded 12.5 t ha^{-1} in coirpith vermicompost (T2) and the yield was similar to enriched coirpith vermicompost and sugarcane trash vermicompost. The increase in N availability and uptake due to vermicompost application delayed leaf senescence and this might be the reason for increased test weight. The increase in yield might be due to higher availability and uptake of plant nutrients and growth substances throughout the crop period. Increase in yield parameters and yield due to vermicompost application was reported by Venkatakrishnan and Balasubramanian (1995) in sunflower and Vasanthi *et al.* (1995) in rice.

Thus, application of vermicompost and enriched vermicompost @ 750 kg ha^{-1} offers a great scope in realisation of higher yield in soybean besides effective utilisation of crop residues and crop industrial waste.

References

Bano, K. and Kale, R.D. (1989). Conversion of poultry resources into protein. **In:** *Proc Nat. Semi. Org. Waste utilisation vermicompost.* Part-B, Verms and vermicomposting (M.C. Dash, B.K. Senapathi and P.C. Mishra) Sr Astatrana. Busta, Orissa pp. 137-145.

Grapelli, A.D., Tomati and Galli, E. (1985). Earthworm castings in plant propagation. *Hort. Sci.* **20:** 874-87.

Kale, R.D., Bano, K. and Krishnamoorthi, R.V. (1982). Potential of *Perionyx excavauts* for utilisation of organic wastes. *Pedobiologia,* **23:** 419-425.

Kale, R.D., Bano, K., Sreenivsa, M.N., Vinayaka, K. and Bagayaraj, D.J. (1988). Incidence of cellulolytic and lignolytic organisms in the earth worm worked soils. *In Proc. X Int. Zool. Collq.* Bangalore.

Kale, R.D., Makesh, B.C., Bano, K. Bagyaraj, D.J. (1992). Influence of vermicompost application on the availability of macro nutrients and selected microbial population in a paddy field. *Soil Biol. Bio Chem.* **24:** 1317-1320.

Lee., K.E. (1985). Earthworms: Their Ecology and relationship with soil and land use. Academic press. pp. 188-194.

Vasanthi, D., Rajamannar, A. and Kumaraswamy, K. (1995). Influence of vermicompost on the yield and fertility status of the soil under rice-rice cropping system. *National Symposium on organic farming* pp.3.

Venkatakrishnan, A.S. and Balasubramanian, N. (1995). Effect of organic manures and biofertilizers on the productivity of sunflower. *National Symposium on organic farming* pp. 44-45.

(Received : March 1999 ; Revised : September 2002)