RESEARCH PAPER | Botany | Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

Evaluation of Leaf Litter Compost and Vermicompost on Yield and Nutrient Uptake of Trigonella

KEYWORDS: Compost, Vermicompost, Yield, Trigonella

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ABSTRACT *A field experiment was carried out in the Research farm located at Shibla, Dist. Yavatmal to evaluate the effects of compost prepared from leaf litter by aerobic (NADEP tank) and anaerobic (Bangalore pit) method and vermicompost on the yield and nutrient uptake of fenugreek. These treatments were compared with fertilizer alone (NPK) and absolute control (CON) with four replicates each. Chemical analysis was carried out in Trigonella as crude protein, reducing sugar, dry matter, N, P, K, Ca percentage. Total yield of fenugreek, percent increase over CON was also calculated. The average yield (kg/ha) of fresh vegetation of Trigonella was highest in VC followed by AC, BC NPK and lowest in CON.*

INTRODUCTION:

At present, one of the most important intimidations for human is the disposal of different organic wastes. These wastes include tree leaves, garden wastes, agricultural wastes etc. Leaves are potential sources of valuable nutrients providing a high quality of organic matter, which should be returned to the soil.

The leaves of most trees contain twice as many minerals as manure (Pandit et al., 1989). Since most of the trees are deep rooted, they absorb minerals from the soil and a good portion of these minerals goes into the leaves. The nutrient fluxes from the trees to soil via litter. In fact, these are most valuable for the huge amount of fibrous organic matter to the soil. Using this rich natural fertilizer means less reliance on mineral fertilizers and reduces the quantity of these nutrients which are major pollutants entering local water stream (Reshetiloff, 2005). Leaf litter can be utilized as manure by composting and vermicomposting.

Composting is the controlled decomposition of organic matter to a point where the product can be safely and beneficially used to improve crop productivity (Obeng and Wright, 1987). In terrestrial ecosystems, the litter decomposition is an important functional process, governing the cycling of nutrients and thereby regulating the vegetative productivity. Vermicomposting is the appropriate biotechnological technique for the degradation, converting waste to wealth resulting in a stable non toxic material with good structure, which has a potentially high economic value as soil conditioner for the growth of the plants (Mills, 2006).

Research is carried out on use of different manures prepared from weeds for increasing yield and quality of maize (Naikwade and Jadhav, 2011, Naikwade et al, 2011 a, Naikwade et al, 2012). But very little study was carried out on use of leaf litter compost and vermicompost on yield and nutrients of fenugreek. So in order to utilize the huge amount of leaf litter as valuable resource for composting and vermicomposting, a study was conducted to investigate the influence on Trigonella yield and nutrient uptake.

MATERIALS AND METHODS:

Raw material and composting, vermicomposting process:

The freshly fallen dead leaves were collected and used as raw material to prepare compost and vermicompost during June to October 2010. Composting was done by two methods as NADEP tank (aerobic) and Bangalore pit (anaerobic) methods. Vermicomposting is done in a pit. The process of composting and vermicomposting was followed as described by Stoffella and Kahn (2001).

Experimental site, design and treatments:

The experiment was carried out in the Research farm located at Shibla, Dist. Yavatmal. The Experimental design was a randomized block design (RBD) with five treatments and four replications. The five treatments were (i) NADEP compost (AC); (ii) Bangalore pit compost (BC); (iii) Vermicompost (VC) (iv) Chemical Fertilizer (NPK) and (iv) Control (CON). Composts and vermicomposts were transferred to the experimental area. These treatments were compared with 100 % fertilizers alone (FER) and control (CON). To evaluate the performance of manures, Trigonella–foenum graecum L. seeds were sown at the rate 30Kg/ha in 1.8 x 2.4m plot.

Fertilizer applications and plant sampling:

The mineral fertilizers N, P_2O_5 and K_2O were applied at recommended level. The fresh aerial biomass yield obtained per plot was recorded and kept in oven at 90^0C for 48 h. the dried samples were weighed, finely milled, sieved and stored in labeled airtight polythene bags for nutrients analyses.

ANALYSES:

Chemical analysis-

The chemical analysis of Trigonella crop was carried out at 39 DAS (Days After Sowing) by adopting standard analytical methods. Ash values were obtained (AOAC, 1995). Nitrogen (N) was estimated by micro-Kjeldahl method after digesting the sample with Conc. H2SO4 (Bailey, 1967) and crude protein (CP) was then calculated by multiplying N value with 6.25 as specified by AOAC, (1995). Water soluble reducing sugars was determined by using Folin-wu tubes (Oser, 1979). The amount of phosphorus was measured following Fiske and Subba Rau (1972) as described by Oser (1979). Potassium (K) Content was determined on a flame photometer (model Mediflame 127) as suggested by Jackson (1973).

Statistical analysis-

All the results were statistically analyzed using analysis of variance (ANOVA) test and treatments means were compared using the least significant difference (CD,P≤0.05) which allowed determination of significance between different applications (Mungikar, 1997).

RESULTS AND DISCUSSION:

a) Effect of Leaf litter compost and vermicompost on yield and nutrient uptake of Trigonella.

Table 1 gives information about effect of leaf litter manures on yield of Trigonella. The application of leaf litter compost and vermicompost significantly influenced the yield and nutrient uptake by Trigonella. The average yield (kg/ha) of fresh vegetation of Trigonella was highest in VCOM followed by AC, BC, NPK and lowest in CON. Dry matter yield also fol-

Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

lowed same order. Nitrogen (kg/ha) and Crude Protein (kg/ha) was also found highest in Vermicompost treated plots. Water Soluble Reducing Sugar was highest in VC and AC and lowest in CON.

Table 2 gives details about nutrient uptake of Trigonella. Phosphorus percentage was maximum in BC followed by VC and lowest in CON. Potassium was highest in BC and VC. However Calcium percentage was maximum in AC and Ash values were found high in NPK. All the values are statistically significant than control. Dinesh and Dubey (1999) reported that mineralization of net nitrogen was significantly higher in the soil amended with organic matter as compared to unammended soil. It might be due to the positive effect of organic manures, which on decomposition release macro and micro nutrients, avoid volatilization losses of N, less fixation of applied P. These results are in accordance with Ghadge et al.,(2013), Naikwade (2012).

b) Percent increase over CON

Table 3 shows percentage over control of different treatments. The percent increase over control for fresh weight was maximum in VC followed by AC, BC, NPK and lowest In CON. Dry matter and crude protein also followed same pattern. The results are with the findings of Chamle and Jadhav, (2007) who proved that leaf litter compost improved the yield and the nutrient uptake of spinach. Minhas and Sood (1994) showed that sustainable availability of the nutrients can occur in various crops due to application of organic manure. Organic manures such as compost, vermicompost also have better effect on crop growth (Naikwade, 2011 b)

Vermicompost gave better results than composts. Kalembasa, (1996) and Ismail (1997) showed increase in yield in potato, Sorghum, tomato, cabbage and silage maize due to vermicompost application. Increase in yield due to application of vermicompost is may be due to earthworm castings which contain plant growth promoters, such as auxins and cytokinins (Krishnamoorthy and Vairanabhaiah 1986).

CONCLUSION:

The results of this study conclusively indicate that the leaf litter compost and vermicompost can be effectively used for Trigonella. as reflected by increased yield and nutrient uptake. The vermicompost prepared from leaf liteer was found more effective as compared to both the composts. The vermicomposting biotechnological treatment of leaf litter appears to be most cost effective and ecofriendly technique which is useful for sustainable agriculture.

TABLES: Table 1.Effect of Leaf litter compost and vermicompost on yield of Trigonella. (Age of plant: 39 days)

Treatments	Fresh wt.		Dry Matter		N		C P		WSRS	
	kg/plot	kg/ha	%.	kg/ha	%.	kg/ha	%.	kg/ha	%.	kg/ha
AC	4.82	5356	12.43	666	3.44	23	21.5	134	1.84	12
BC	4.65	5167	12.75	659	3.30	22	20.62	129	1.67	11
VC	5.11	5678	12.64	718	3.62	26	22.62	141	1.65	12
NPK	4.57	5078	12.41	630	3.16	20	19.75	123	1.55	10
CON	2.89	3211	12.28	394	3.05	12	19.06	119	1.44	6
SE	0.39	434		57		2.34		3.94		1.19
CD	0.96	1063		139		5.73		9.64		2.91

SE- Standard Error, CD- Critical Difference, N- Nitrogen, CP- Crude Protein, WSRS- Water Soluble Reducing Sugar, AC- Aerobic Compost, BC- Anaerobic Compost, VC- Leaf Litter Vermicompost, NPK- Chemical Fertilizer, CON- Control.

Table.2. Effect of Leaf litter compost and vermicompost on Nutrient contents of Trigonella

Treatments	Percentage (%)			
	P	K	Ca	Ash
AC	0.52	0.37	0.92	13.42
BC	0.58	0.39	0.85	13.11
VC	0.55	0.39	0.89	13.24
NPK	0.53	0.34	0.84	14.06
CON	0.43	0.33	0.67	13.18

Table 3. Percent increase over control

Treatments	Fresh wt.	Dry Matter	Crude Protein
	Kg/ha		
AC	66	69	12
BC	60	67	8
VC	77	82	18
NPK	58	60	3
CON	0	0	0

Volume : 4 | Issue : 2 | Feb 2014 | ISSN - 2249-555X

REFERENCE

A. O. A. C., (1995). Official Methods of Analytical Chemistry. 16th Ed., Association of Official Analytical Chemists, Washington, DC. | Bailey, R.L., (1967). Techniques in Protein Chemistry. II Ed., Elsevier Publishing Co., Amsterdam. | Chamle D.R. and Jadhav B., (2007). Evaluation of leaf litter compost on yield and nutrient uptake of spinach. J. Phytol. Res. 20(2): 219-223. | Dinesh, R. and Dubey R.P. (1999). J. Indian Soc. Soil Sci.47:421-425. | Ghadge S., Naikwade P. and Jadhav B. (2013). Utilization of problematic weed for improved yield of fenugreek, Indian Stream research Journal 3(4): 1-8. | Ismail, S. A., (1997). Vermicology: The Biology of Earthworms. Orient longman Press, Hyderabad, : 92. | Jackson, M L. (1973). Soil Chemical Analysis. Prentice Hall of India Pvt. Ltd., New Delhi. | Kalembasa, D. (1996). Folia Universitatis Agriculturae Stetinensis Agricultura. 81: 123 –127. | Krishnamoorthy, R.V. and Vajranabhaiah, S.N. (1986). Biological activity of earthworm casts: An assessment of plant growth promoter levels in the casts. Proc. Indian Acad. Sci. (Anim. Sci.). 95: 341-351. | Mills, T. (2006). Composting cafeteria residuals with earthworm. Biocycle. 47: 55-55. | Minhas R.S. and Sood A., (1994). Effect of Inorganics and Organics on the Yield and Nutrient Uptake by Three Crop Rotations on an Acid Alfisol. Journal of Indian Society of Soil Science, 42: 257–260. | Mungikar, A.M. (1997). An Introduction to Biometry. Sarswati printing press Aurangabad, 25-29. | Naikwade P.V. and Jadhav B.B. (2011). Effect of Trianthema weed manures on fodder, Bioinfolet, 8(2):174-176. | Naikwade P.V., Mogle U. and Jadhav B.B. (2011 a). Effect of Ipomoea weed manures on quality of fodder crop maize, Research journal of agricultural science, 2(4):927-930. | Naikwade P.V., Mogle U.P. and Jadhav B.B. (2011 b). Improving Total chlorophyll, ascorbic acid and β -carotene in spinach by applying weed manures, Bioscience discovery, 2(2):251-255. | Naikwade P.V. (2012). Conversion of Parthenium hysterophorus L. weed to nutrient resource by composting. NeBio 3(4): 171-179. | Naikwade P.V., Sankpal, S.T. and Jadhav B.B. (2012). Management of waste by composting, vermicomposting and its use for improvement of growth, yield and quality of fodder maize, ARPN Journal of Science and Technology 2(5): 184-194. | Obeng, L.A. and Wright, F.W., (1987). The Cocomposting of Domestic Solid and Human Wastes.World Bank Technical Report No. 57, The World Bank, Washington, D.C. | Oser, B L. (1979). Hawk's Physiological Chemistry. XIV Ed., Tata McGraw Hill Publishing Co. Ltd., New Delhi. | Pandit, B.R., Subrahmanyam S.V.S. and Raghavendra Rao K.V., (1989). Indian Bot. Reptr., 8(2): 118 - 120. | Reshetiloff, K., (2005). Composting autumn leaves a golden opp. Chesapeake Bay Journal, 22: 25–29. | Stoffella, P.J. and Kahn, B.A. (2001). Compost utilization in horticultural cropping systems. Lewis publishers, Florida.