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Performance of nutrient content in vermicompost preparation under different bio-wastes and its economics

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Abstracts

The present investigation was carried out at RVSKVV-Krishi Vigyan Kendra, Morena (M. P.) during 2015-16. The treatment combination of bio-wastes comprised T_1- Soybean straw + cow dung (3:1), T_2- Soybean alone, T_3- Paddy straw + cow dung (3:1) and T_4- Paddy straw alone. Earthworm species Eisenia Fotida was used for the preparation of vermicompost. The bio-wastes were chopped into 1 to 2 cm pieces, mixed, moistened and kept in shade for 45 hours to reduce the bulk volume. Vermicompost was prepared following pit method having pit size of 10×5× 2 ft. Pits were field with mixture of bio-wastes and cow dung as per treatments and spared of 1480 earthworm/pit in T_1, 1498 earthworm/pit in T_2, 1510 earthworm/pit in T_3 and 1428 earthworm/pit in T_4 treatments in each beds. All beds were covered with gunny bags and kept in shade at 16.5 to 41.5 ^{o}C for 66 to 92 days. The higher nutrient (N, P and K) content in vermicompost with use of cow dung in compost mixture. Incorporation of Soybean straw in compost mixture resulted in higher amount of available N (0.24-1.35%) and P (1.15-2.25%) in vermicompost as compared to paddy straw. Paddy straw incorporation in compost mixture yielded vermicompost with higher amount of K (0.88-1.95%) as compared to soybean straw. The complete vermicompost conversion rate was higher in soybean straw as compared to paddy straw in both treatments with or without cow dung. The economics and Benefit Cost Ratio (BCR) of all treatments was worked out. On an average Rs.10110/- net returns of vermicompost per pit/year and BCR was 1:3.53 per pit/year respectively. The study will generate the technology for bio-wastes as cheapest source of nutrients and also use of farmers may be using it as additional source of income generation.

Keywords: Bio-wastes, Combination, Nutrients, Vermicompost, Economics

Introduction

Most of the cultivated lands are deficient in organic matter which directly influences the growth and survivalist of flora and fauna. The organic matter is essential for integration of microbes which have positive effect on physical, chemical and biological properties of soil. Vermi compost provides an option to combat the problems pertaining to soil health and minimize the hazards of soil and water.

The diversification of organic sources of plant nutrients and the use of compost or vermi-compost has become an important input in integrated use of plant nutrient supply due to the escalating cost of chemical fertilizers and the pollution of the environment. Recycling of crop residues plays an important role in energy flow and nutrient cycling besides its. Influence on physics-chemical and biological properties of the soil. Vermiculture technology has emerged as an efficient eco-friendly waste management system, where in earthworms are used as natural bio-reactor for faster decomposition of organic wastes and producing compost enriched with mineralizable plant nutrients.

Epigeic earth worm species like Eisenia foetida and Perionyx exactus decomposes all types of organic wastes into compost (Karthikeyan, 2000). The largest quantity of agriculture residues generates in India such as straw of paddy, wheat, barley, soybean, pulses, husk of groundnut and mustard etc. Hence the present study

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was conducted to evaluate the quality of vermicompost prepared from mixing different biomass with dung and also evaluate the economics of vermicomposting of different combination of bio-wastes.

Materials and Methods

The present investigation was carried out at RVSKVV-Krishi Vigyan Kendra, Morena (M.P.) during 2015-16. The materials used in the present investigation are described here under. The basic raw materials used for vermicomposting- soybean straw, paddy straw and cow dung. The treatment combination of bio-wastes comprised T1- Soybean straw + cow dung (3:1), T2-Soybean alone, T3- paddy straw + cow dung (3:1) and T4- paddy straw alone. The earthworm species Eisenia Fotida was used for the preparation of vermicompost. The bio-wastes were chopped into 1 to 2 cm pieces, mixed, moistened and kept in shade for 45 hours to reduce the bulk volume. The vermicompost was prepared following pit method having pit size of 10*5*2 ft.

Pits were field with mixture of bio-wastes and cow dung as per treatments and spared of 1480 earthworm/pit in T_1, 1498 earthworm/pit in T_2, 1510 earthworm/pit in T_3 and 1428 earthworm/pit in T_4 treatment in each beds. All beds were covered with gunny bags and kept in shade at 16.5 to 41.5 ^{0}C for 66 to 92 days. The content of pits were moistened and mixed periodically throughout. On maturity, vermicompost was taken out from the pit, mixed, air-dried in shade, sieved through 2 mm size, and use for chemical analyses.

Results and Discussion

Changes in dry matter:

The dry matter content (%) of the entire organic residues showed decreasing trend during the composting (Table1). The dry matter content during vermicomposting varied from 58% (Soybean straw + cow dung), 54 (Soybean straw alone), 42 (Paddy straw + cow dung) and 46 (Paddy straw alone) on 28 days.

Dry matter content decreased with decomposition during vermicomposting in all the organic residues, might be due to total dry matter is lost as carbon dioxide through microbial respiration and mineralization of dry matter causing increase in nitrogen, part of the carbon in the decomposing residues released as co_2 and part was assimilated by the microbial biomass, micro organisms used the carbon as a source of energy and decomposing the organic matter (Lakshmi, 2014).

Changes in NPK:

The data presented in Table 1. The changes in NPK content during vermicomposting from 7 to 75 days were N-0.42 to 1.35%, P-1.72 to 2.25% and K-1.08 to 1.78% (soybean straw + cow dung). The changes in NPK content during vermicomposting from 7 to 92 days were N-0.24 to 1.12%, P-1.15 to 2.20% and K-0.75 to 1.75% (soybean alone). In case of paddy straw+cow dung NPK content during vermicomposting

Table 1: Changes in contents of earthworm under different combination of Bio wastes

Combination of Bio wastes	Days	Temp. (°C)	OM (%)	N (%)	P (%)	K (%)	Obtained Dry Matter (%) 7days	14days	21days	28days
Partial decomposition:										
T_1-(Soybean straw+Cow dung)3:1	7	41.5	7.3	0.42	1.72	1.08	90	85	78	58
T_2- (Soybean straw alone)	7	44.0	7.4	0.24	1.51	0.75	88	86	75	54
T_3-(Paddy straw+Cow dung) 3:1	7	40.0	6.82	0.25	1.28	1.30	82	60	50	42
T_4 (Paddy straw alone)	7	38.0	6.82	0.28	0.65	0.88	87	65	52	46
During Vermicomposting:							Earthworm (kg/pit)		Earthworm (No./m^2)	
T_1-(Soybean straw+Cow dung)3:1	26	23.5	7.1	0.98	2.19	1.68	2.86		1480	
T_2- (Soybean straw alone)	29	24.0	7.1	0.82	1.68	1.30	2.95		1490	
T_3-(Paddy straw + Cow dung) 3:1	22	22.0	6.61	0.88	1.85	1.90	2.70		1510	
T_4 (Paddy straw alone)	27	27.0	6.64	0.77	1.62	1.48	2.77		1428	
Complete Vermicomposting:							Conversion rate			
T_1-(Soybean straw+Cow dung)3:1	75	17.6	7.55	1.35	2.25	1.78	2.6 q/2810 earthworm/pit			
T_2- (Soybean straw alone)	92	18.0	7.40	1.12	2.20	1.72	2.5 q/3200 earthworm/pit			
T_3-(Paddy straw + Cow dung) 3:1	66	16.5	7.20	0.95	1.92	1.95	2.2 q/2710 earthworm/pit			
T_4 (Paddy straw alone)	70	19.5	7.30	0.88	1.98	1.92	2.1 q/2783 earthworm/pit			

Table 2: Economics of Vermicomposting under different combination of Bio wastes

Treatments	Gross cost (Rs./pit/year)	Gross returns (Rs./pit/year)	Net returns (Rs./pit/year)	BCR (Rs./pit/year)
T_1-(Soybean straw + Cow dung) 3:1	4120	14520	10400	1:3.52
T_2- (Soybean straw alone)	4200	13850	9650	1:3.30
T_3-(Paddy straw + Cow dung) 3:1	3450	13820	10370	1:4.00
T_4 (Paddy straw alone)	4200	14220	10020	1:3.40
Average	3992.50	14102.50	10110	1:3.53

BCR: Benefit Cost Ratio

from 7 to 66 days were N-0.25 to 0.95%, P-1.28 to 1.92% and K-1.30 to 1.95% respectively. The changes of NPK content during vermicomposting from 7 to 70 days were N-0.28 to 0.88%, P- 0.65 to 1.98% and K-0.88 to 1.72% (paddy straw alone). The total NPK content increased during composting process. Irrespective of the composting methods significantly higher NPK content was recorded in soybean straw + Cow dung and lower N K content was recorded in soybean straw alone and P content was recorded in paddy straw alone respectively, might be the initial raw materials itself contained low NPK content. Similar findings were reported by Kikon and Sharma (2005), Kumar, R. and Pal, S. (2010) and Surindra Suthar (2009).

Changes in conversion rate:

The data presented in table 1 revealed that the conversion rate of soybean straw + cow dung (75 days), soybean alone (92 days), paddy straw + cow dung (66 days) and paddy straw alone (70 days) of vermicomposting were 2.6q/2810 earthworm/pit 2.5q/3200 earthworm/pit, 2.2q/2710 earthworm/pit and 2.1q/2783 earthworm/pit, respectively. In both the soybean straw treatment recorded the highest conversion rates while both paddy straw treatments.

Economics of Vermicomposting:

The economics of vermicomposting under different combination shows in Table 2. The net returns (Rs./pit/year) soybean straw + cow dung, soybean alone, paddy straw + cow dung and paddy straw alone were 10400, 9650, 10370 and 10020, respectively. The economics of the vermicomposting performance revealed that Benefit Cost Ratio (BCR) of the study were observed significantly higher with cow dung treatment T1 and T3 than treatment of T2 and T4. The BCR (Rs./pit/year) of T1, T2, T3 and T4 treatments were 1:3.52, 1:3.30, 1:4.00 and 1:3.34, respectively.

References

Karthikeyan, S. (2000). Compost maturity indices. In short course on vermiculture and vermin composting technology, *Tamil Nadu Agri. Univ.,* Coimbatore, 98.

Kikon, Z.J. and Sharma, S.K. (2005). Total and available nitrogen, Phosphorus and potassium content in vermin compost of different species of earth worms. *Annals of Agri. Res.,* New series 26 (1): 13-17.

Kumar, R. and Pal, S. (2010). Nutrient content is vermicompost prepared from different biomass with dung: *Ann. Pl. Soil Res.,* 12(2): 171-172.

Lakshmi, C.S.R., Rao, P.C., Padmaja, G., Sreelatha, T., Mathavi, M. and sireesha, A. (2014). Evaluation of different vermicomposts and conventional composts for their maturity indices, *Indian J. Agri. Res.,* 48 (3): 205-210.

Surindra Suthar (2009). Vermicomposting of vegetable market soil waste using Eisenia foetida: Impact of bulky materials on earth worm growth in decomposition rate. *Environmental Biology*, 35: 914-920.