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ASSESSMENT OF GROWTH AND ACTIVITIES OF *Eisenia foetida* UNDER DIFFERENT COMBINATIONS OF BIO-WASTES

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Abstracts: *The present study was undertaken to find out the growth and activities of earthworm species Eisenia fetida on the different combinations of bio wastes along with its economics at demonstration unit of RVSKVV, Krishi Vigyan Kendra, Morena (M.P) during 2016-17 with treatments T_1 –Soybean straw + cow dung (3:1), T_2 Soybean straw alone, T_3-Paddy Straw + cow dung (3:1), and T_4-Paddy straw alone. Earthworm species Eisenia foetida was used for the preparation of vermicompost. The vermicompost was prepared by pit method having pit size of 10 ×5×2 ft. Pits were filled with mixture of bio –wastes and cow dung as per treatments .The higher nutrient content (N,P) viz. 1.32%, 2.20% was found in vermicompost obtained from T_1 Soybean straw + cow dung (3:1) however the higher Potash content viz. 1.94% was found in vermicompost obtained from T_3 Paddy Straw + cow dung (3:1). Lowest conversion rate was observed as 68 days in T3 followed by 81 days in T4, 72 days in T_2 and 98 days in T1, respectively. The economics of vermicomposting in different treatment revealed higher BCR in T_2 (3.01:1) followed by T_3 (2.53:1), T_4(3.01:1) and T_1(2.24:1), respectively.*

Keywords*: Bio –wastes, Combination, Nutrients, vermicompost, BCR*

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 pollution.

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 physico-chemical and biological properties of the soil. Vermiculture technology has emerged as an efficient eco-friendly waste management system, which enables faster decomposition of organic wastes and produces compost enriched with important minerals necessary for plant growth.

Epigamic earth worm species like *Eisenia foetida* and *Perionyx exactus* decomposes all types of organic wasted into compost [1]. The largest quantity of agriculture residues generated in India includes straw of paddy, wheat, barley, soybean pulses, husk of groundnut and mustard etc. Hence the present study 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 2016-17. The basic raw materials used for vermicompost preparation includes - soybean straw, paddy straw and cow dung. The treatment combination of bio-wastes comprised of T_1 – soybean straw + cow dung in the ratio of 3:1,T_2 soybean alone, T_3 paddy straw + cow dung in the ration of 3:1 and T_4 paddy straw alone. The earthworm spices *Eisenia foetida* was used for the preparation of vermicompost in the pit having pit size of 10X5X2 ft. Pits were filled

with mixture of bio-wastes and cow dung as per treatments with spreading 1460 earthworms /pit in T_1, 1492 earthworms /pit in T_2, 1508 earthworms /pit in T_3 and 1430 earthworms /pit in T_4 treatment in each beds. All pits (beds) were covered with gunny bags and kept in shade at 16.4^0c to 38^0c for 68 to 98 days. The content of pits were moistened and mixed periodically throughout the experimental period. On maturity, vermicompost was taken out from the pit, mixed, air-dried in shade, sieved through 2mm size sieve and subjected for chemical analysis.

Result and Discussion

Change in Dry Matter: The dry matter content (%) of the entire organic residues showed decreasing trend during the compositing (Table 1). The dry matter content during vermicomposting varied from 56% (soybean straw + cow dung), 68% (soybean straw alone), 42% (Paddy straw + cow dung and 47% (Paddy straw alone) after a period of 28 days. Dry matter content decreased with decomposition during vermicomposting in all the organic residues, might be due to loss of dry matter 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 micro organisms as a source of energy and decomposing the organic matter [2].

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

Combination of Bio wastes	Days	Temp (^{0}C)	pH	N (%)	P (%)	K (%)	Obtained Dry Matter(%)			
							7 days	14 days	21 days	28 days
Partial decomposition										
T_1-(Soybean straw+Cow dung) 3:1	7	34:8	7.3	0.38	1.64	1.04	91%	86	75	56
$T_{2-(}$ Soybean straw alone)	7	38.0	7.4	0.25	1.14	0.74	93	88	80	68
T_3 (paddy straw + Cow dung)3:1	7	34.0	6.83	0.28	1.24	1.35	84	62	50	42
T_4(paddy straw alone)	7	35.0	6.81	0.30	0.64	0.87	88	66	54	47
During vermicomposting							**Earthworm (kg/pit) Earthworm (No/m^2)**			
T_1 (Soybean straw+Cow dung)3:1	28	24.5	7.1	0.96	2.11	1.60	2.72	1460		
T_2(Soybean straw alone)	30	24.6	7.2	0.83	1.69	1.40	2.92	1492		
T_3 (paddy straw + Cow dung)3:1	26	22.0	6.6	0.87	1.84	1.96	2.70	1508		
T_4(paddy straw alone)	27	26.0	6.65	0.76	1.61	1.47	2.76	1430		
Complete vermicomposing				**Conversion rate**						
T_1-(Soybean straw+Cow dung)3:1	81	17/5	7.5	1.32	2.20	1.75	2.5q/ 2815 earthworm/ pit			
T_2(Soybean straw alone)	98	17.9	7.4	1.10	2.18	1.72	2.5q/3200 earthworm/ pit			
T_3 (paddy straw + Cow dung)3:1	68	16.4	7.3	0.94	1.90	1.94	2.3q/2712 earthworm/ pit			
T_4(paddy straw alone)	72	18.8	7.4	0.89	1.96	1.91	2.2q/2783 earthworm/ pit			

Changes in NPK: The data presented in table 1 indicates the changes in NPK content during vermicomposting process in the T_1 (soybean straw + cow dung) during 7 to 81 days were N-0.38-1.32 %, P-1.64-2.20% and K-1.04-1.75 %. The changes in NPK content during vermicomposting process in T_2 (Soybean alone) during 7 to 98 days were N-0.25 to 1.10%, P-1.14 to 2.18% and K-0.74 to 1.72 %. In case of T_3 (paddy straw + cow dung) NPK content during vermicompositng during 7 to 68 days were N-0.28 to 0.94%, P-1.24 to 1.90% and K-1.35-1.94% respectively. The changes in NPK content in vermicomposting in T_4 (paddy straw alone) during 7 to 72 days were N-0.30-0.89%, P-0.64 to 1.96% and 0.87 to 1.91%. The total NPK content increased during the composting process in all the treatments. Irrespective of the composting methods significantly higher NPK content was recorded in T_1 (soybean straw +cow dung) and lower N K content was recorded in T_2 (soybean straw alone) and lower P content was recorded in T_4 (paddy straw alone), respectively. The possible reason behind these lower values might be the low initial content of NPK in the raw material [3-5].

Changes in Conversion Rate: The data presented in table 1 revealed that the conversion rate of raw material to vermicompost in T_1, T_2, T_3 and T_4 were 81 days, 98 days, 68 days and 72 days respectively. The quantity of vermicompost produced by different treatments were 2.5q/2815 earthworms/pit, 2.5q/3200 earthworms/pit, 2.3q/2712 earthworms/pit and 2.2q/2783 earthworms/pit in T_1, T_2, T_3 and T_4 respectively. Both the soybean straw treatments recorded the highest conversion rates in comparison to both paddy straw treatments.

Economics of Vermicomposting: The economics of vermicomposting under different treatment are shown in Table 2. The net returns (Rs./pit/year) in T_1, T_2, T_3 and T_4 were 4952, 4638, 4360 and 3850, respectively. The BCR of different treatments viz. T1, T2, T3 and T4 were 2.24:1. 3.01:1, 2.53:1 and 2.42:1 respectively.

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	2680	7632	4952	1:2.84
T_2(Soybean straw alone)	2300	6938	4638	1:3.01
T_3 (paddy straw +Cow dung)3:1	2840	7200	4360	1:2.53
T_4(paddy straw alone)	2710	6560	3850	1:2.42
Average	2632.5	7082.5	4450	1:2.68

BCR: Benefit Cost Radio

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