IJCRT Publish Paper record is available at DOI: http://doi.one/10.1727/IJCRT.17121

SOLID WASTE MANAGEMENT BY VERMICOMPOSTING

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The due increase in population in the country has resulted significant increase in soild waste generation over a last few years. The present paper aims at management of soild waste in regard to vermicomposting to help minimize the quantity upto the extent possible as it is also a cost effective technique. The study aimed to convert vegetable market waste in to vermicompost by deploying earth worm species Eisenai Fetida. The various parameters like Organic matter, COD, C: N ratio, pH value, carbon, nitrogen, etc were observed in analysis. With the vermicompost, the plant growth is improved, soil quality is enhanced which help manage agricultural, domestic waste. Therefore, vermicomposting is highly nutritive organic fertilizer.

Keywords: *C/N Ratio , Vermicompost, Vegetable waste, Earthworms, Muncipal Solid Waste*

I. INTRODUCTION

India is on the path of rapid industrialization & urbanization. Better work opportunities & the dream of better lifestyle has spread rural migration. The infrastructure development of the boomed structure has not able to keep waste influx within the cities & the municipalities are straining their limits providing basic service. Solid waste has been major environmental issue in India. MSW in cities is collected by respective municipalities & transport to the outskirts of the city. The limited reviews and high amount make them ill equipped to provide high cost involved in collection, storage, transportation, processing etc as a result a substantial part of MSW generates remains unattended and grows in heaps at collection centre. There is a lack of awareness among the peoples about the proper segregation at the source. As India population has been increasing continuously, along this education system also grows continuously.

Solid Waste Management (SWM) is associated with the control of waste generation, its storage, collection, transfer & transport, processing & disposal in a manner that is in accordance with the best principles of public health, economics, engineering, conservation, aesthetics, public attitude and other environmental considerations.

Put differently, the SWM processes differ depending on factors such as economic status (e.g., the ratio of wealth created by the production of primary products to that derived from manufactured goods, per capita income, etc), degree of industrialization, social development (e.g., education, literacy, healthcare, etc.) and quality of life of a location. In addition, regional, seasonal and economic differences influence the SWM processes. This, therefore, warrants management strategies that are economically viable, technically feasible & socially acceptable to carry out such of the functions as are listed below (*http://ces.iisc.ernet.in/energy/SWMTR/TR85.html*):

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- Protection of environmental health.
- Promotion of environmental quality.
- Supporting the efficiency & productivity of the economy.
- Generation of employment & income.

Vermicomposting has been reported to be a viable, cost effective & rapid technique for the efficient management of organic solid wastes (Logsdon 1994). Vermicomposting, utilizing earthworms, is an eco-biotechnological process that transforms energy-rich & complex organic substances into a stabilized humus-like product (Benitez et al 2000). Vermicomposting is an important aspect, as it converts waste to wealth by using cheap eco-friendly option with activity of earthworm (Mall et al. 2005).

A. Advantages of Vermicomposting

[1] It is cost effective method.

[2] It helps destroy the harmful pathogens under the low temperature conditions.

[3] The earthworms have a tendancy to treat the medium of soil (acidic or alkaline) to neutral soil. Thus it could prove as a soil pH regulator.

[4] With the effect of earthworms soil becomes fertile, improves soil texture and water application reduces.

[5] The optimal carbon/nitrogen (C/N) ratio is available in vermicompost, which determines the quality of compost.

Table 1. Composition in Municipal Solid Waste.

Sr.	Type of Waste	Percentage by Waste
1	Vegetable waste	40.15
2	Grass	3.8
3	Paper	0.81
4	Plastic	0.62
5	Glass/Ceramic	0.44
6	Metal	0.64
7	Stone/ashes	41.81
8	Miscellaneous	11

II. OBJECTIVE OF THE STUDY

[1] To analyze the potential of species *Eisenia fetida* earth worms in regard to vermicomposting.

[2] To judge the suitability of vermicomposting technology or safe disposal of organic waste.

[3] To know about the rate of vermicomposting.

III. METHODOLOGY

The present case study shows the setup done at Vadodara city. It had chosen vermicomposting process using earthworm to analyze the vegetable market waste. The vegetable waste were obtained from vegetable market like tomato, brinjal, cabbage, potato, cauliflower, leafy vegetables and ladies finger. The *Eisenia fetida worms* were brought from the farm of Zoology Department of M.S.

University of Vadodara & Vermicompost Plant of M/s Hanjer Biotech Energies Pvt Ltd ,Vadodara India. The waste samples were cut into pieces and dried in shade, by spreading over a ground for 24 hours. Then waste was put in to container along with soil and kept for ten days prior to the inoculation of worms.

IV. EXPERIMENTAL SETUP

The study was carried out in Vermicompost experimental plots set up at Hanjer Biotech Pvt. Ltd, Vadodara city of Gujarat. The vermin shed were prepared by use of boxes made of plastic (45 x 30 x 30 cm) containing soil and vegetable waste with replicates and kept for 45 days. Earthworms were introduced ten days after into the boxes. The bedding has been kept moist throughout the experiment by regular watering. The various parameters such as pH, COD, TOC, the nutrients such as total nitrogen, phosphorus and potassium were determined.

V. FIGURES.

Fig.1 Vegetable waste

Fig. 2 Compost Pit above the ground

Fig. 3 Eisenia Fetida worm

VI. RESULTS:

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Table No II. Characteristic of Soil & Vegetable waste mix.

Sr. No	Name of Parameter	Initial Parameters (Based on Dry matter)			
		Soil + Vegetable waste			
		Reactor Set up			
		Batch 1	Batch 2	Batch 3	Batch 4

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	WE:WS:WV (WE+WV) gm	0:5:5 600	0:5:10 750	0:10:10 1000	0:10:15 1250
1.	Organic matter	338.280	516.900	563.80	798.80
2.	COD	180.00	287.50	315.00	440.00
3.	Total Organic Carbon	110.820	167.500	184.700	259.850
4.	Total Nitrogen	1.036	0.969	1.723	1.832
5.	Calcium	4.311	6.593	7.185	10.105
6.	Magnesium	0.903	1.003	1.505	1.755
7.	Sodium	15.30	15.50	25.50	28.250
8.	Potassium	4.590	7.225	7.650	11.050
9.	C/N Ratio	106.970	172.980	106.950	141.840
10.	pH	6.9	6.6	6.9	6.72

Table No. III . Percentage changes in Vermicomposted waste.

Sr. No	Name of Parameter (%)	Final Parameter of Composted Vegetable waste					Ini. Parameter of Veg. waste	Difference	% change
		Batch 1	Batch 2	Batch 3	Batch 4	Mean			
	WE:WS	1:5	1:0:5	1:0:10	0:10:15				
1.	Organic matter	42.3	48.88	55.46	60.16	51.7	94	42.3	45
2.	COD	12	16	20.5	23.5	18	50	32	64
3.	Total Organic Carbon	5.41	6.91	7.89	9.32	7.363	30.06	22.697	75.5
4.	Total Nitrogen	0.089	0.284	0.087	0.217	0.169	0.042	0.127	30.38
5.	Calcium	1.613	1.5	1.553	1.513	1.567	1.2	0.36	30
6.	Magnesium	0.011	0.107	0.104	0.101	0.107	0.1	0.007	.07
7.	Sodium	1.73	1.515	1.51	1.32	1.519	1.1	0.419	38.09
8.	Potassium	1.56	1.51	1.505	1.48	1.514	1.36	0.151	11.1
9.	C/N Ratio	60.78	24.33	89.77	42.88	54.44	715.71	661.27	
10.	pH	6.91	7.11	7.12	7.23	7.1	6	1.1	

VII. CONCLUSION

[1] Earthworm specie Eudrilusengeniae capable to convert 50 percent organic matter of Vegetable waste into vermicompost.

[2] COD and TOC of Vegetable waste reduced by 64 percent and75.5 percent respectively of its initial value in 45Days period.

[3] The initial acidic ph get buffered to neutral due to Vermicomposts.

[4] There is increasing nitrogen content.

[5] C/N ratio 715.71 drastically reduced to 54.44 in 45 Days period.

[6] Weight of Vegetable waste reduced to 53.79 percent of initial weight.

[7] Vermicompost is a high rich nutrient fertilizer. It also cause reduction of organic solid waste.

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