



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 7, July 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 [ijrset@gmail.com](mailto:ijrset@gmail.com)

 [www.ijrset.com](http://www.ijrset.com)

# Study on Comparative Analysis of Vermicomposting between *Eisenia Fetida* and *Eudrilus Eugeniae* Earthworms

Alok Choukiker, Prof. Anurag K. Gahalod, Prof. V. U. Kosamkar

Department of Civil Engineering, G H Rasoni University, Amravati, India

**ABSTRACT:** The scope of this study involves the vermicomposting-based solid waste management system used in the city of Betul. As the production of organic waste has grown to be a citywide environmental concern. The population, their religious practices, living conditions, level of industrialization, and numerous operations carried out in the city that produce solid waste all play a role in how the solid trash is managed. There are many methods available for waste management. Out of which, for MSW, vermicomposting can be used for the recycling of waste. It is a mesophilic process utilizing microorganisms. In this method, *Eudrilus Eugeniae* earthworms are used for 90 days to recycle the waste. After 45 days, organic matter, total oxygen demand, Ph, TP, TC, TOC, TKN, and C-N tests were carried out, and their initial and final readings were analysed. The recovery of vermicompost and the increase in earthworms were analysed. Vermiculite composting can be done very easily and is able to dispose of municipal waste properly. Waste is transformed into manure, which may be utilized in agriculture once it has decomposed. Earthworms are now again being produced, and we may employ them to continue vermicomposting organic waste. This study identifies the waste management possibilities of vermicomposting.

**KEYWORDS:** Vermicomposting, (MSW), *Eudrilus eugeniae*, & *Eisenia fetida*, Solid Waste Management.

## I. INTRODUCTION

Betul is one of the marginally located southern districts of Madhya Pradesh, lying almost wholly on the Satpura plateau. It occupies nearly the whole width of the satpura range between the valley of the Narmada on the north and the bharer plains on the south. It forms the southernmost part of the Bhopal Division. The district extends between 21-22- and 22- 24- degrees North Latitude and between 77-10- and 78-33- degrees East Longitude and forms a compact shape, almost a square with slight projection on the East and the West. Betul city generates about 25.06MT municipal solid waste per day. The present method of solid waste disposal in the city has not been satisfactory. The wastes are disposed in most unscientific way on to the land thereby posing threat to environment and public health.

Composting is said to be an organic and aerobic method of treating solid waste. Vermicomposting is a sort of composting where certain species of earthworms are employed to speed up the conversion of organic waste and create a higher-quality final product. It is a mesophilic technique that uses microorganisms and earthworms to produce a mixture of bedding materials, vermiculite, and decaying food or vegetable waste. Typically, red-wigglers, white worms, and other earthworms like *Eudrilus eueinae*, *Lumbricus rubellus*, etc. are utilized. Since it is a natural process and beneficial to city residents in many ways. Typically, garbage from vegetable markets, street meals, restaurants, mess, etc. is included in municipal solid waste. Leachate, insects, and bad odors are produced as a result of the excess moisture in these wastes, which pollutes the ground. Vermicomposting is therefore the preferred option for disposing of municipal solid waste in order to prevent this. containing nutrients that are water-soluble, Vermicompost is an organic fertilizer and soil conditioner that is rich in nutrients and very simple for plants to consume. Inorganic fertilizer made from worm castings is occasionally utilized. Plants require little effort to get minerals because earthworms consistently blend and ground them into their basic forms. Because of the conditions that the worms' digestive tracts produce, specific microorganism species can flourish and contribute to the development of a "living" soil habitat for plants.

## III. MATERIAL AND METHODS

### i. Plastic Pots-

Three plastic planters with a capacity of 8 to 9 kg were employed for the vermicomposting process and were given the names S1, S2, and S3. The pots are arranged as seen in the figure. I



Figure I Compost Pots

ii. Materials used for vermicomposting-

Different amounts of earthworms, dirt, and garbage were introduced to these pots. In Table I, the proportions that were added are listed below.

Table I Sample Properties

Samples	Proportions (E:S:W)
S1	1:05:05
S2	1:05:10
S3	1:10:15

For the above percentage scale, 50 g is chosen as 1 unit. We used 250gm of material for 0:5:0.

iii. Methods-

We took our first samples on November 30, 2022, and after 15 days, i.e., on January 15, 2023, there was an addition of *Eudrilus Eugeniae* earthworms in the pot according to a certain proportion as indicated above. Worms were responsible for waste disposal and full recycling during this time. The last sample was obtained after 90 days on April 15, 2023. Then both initial and final values were evaluated.

iv. Chemical Analysis-

The tests were conducted initially and after 90 days. Soil and vegetable waste were the initial parameters calculated based on dry matter. Calculations were made for the organic matter, COD, TOC, total nitrogen, carbon, sodium, magnesium, and potassium, as well as the C/N ratio and Ph.

IV. RESULT AND DISCUSSION

i. Chemical Analysis- A small amount of each sample was taken out for chemical analysis, and tests including those for organic carbon, chemical oxygen demand, TKN, calcium, magnesium, sodium, potassium, C/N ratio, and PH were run. Readings were taken at the beginning and end of the process (90 days after completion). These allowed us to determine the mean across all of the samples (S1, S2, and S3), which we then used as our final reading. The weight of the earthworms added to the samples and the weight of the vermicompost both changed after 90 days as a result of the decomposition of waste caused by earthworms. Therefore, the weight of the sample at the beginning and the weight of the vermicompost produced after vermicomposting can be compared, as shown in Table II below.



**Table II Compost Ingredients**

	WE	WS	WV	Wt. of Earthworm		Wt. of Vermicompost	
				Initial	Final	Initial	Final
S1 (1:5:5)	50	250	250	50	100.6	500	240
S2 (1:5:10)	50	250	500	50	200.2	750	376.4
S3 (1:10:15)	50	500	750	50	196.7	1250	622



By comparing the original and final measurements, it is possible to compute the percentage changes in the vermicompost and vegetable waste. The percentage variations in the properties of vegetable waste and vermicompost are shown in Table III below.

Table No. III's results showed us that:

1. The earthworm *Eudrilus Eugeniae* species can turn 61.32% of the organic materials in vegetable waste into vermicompost. When compared to *Eisenia fetida* species, vermicompost can be made from up to 90% of the organic material in vegetable waste.
2. In a 90-day timeframe, COD and N of vegetable waste decreased by 94.13 percent and 93.15 percent, respectively, from their baseline values.
3. Vermicompost buffers the initial acidic pH to neutral.
4. Vermicompost has substantially more Ca, Mg, Na, and K.
5. The nitrogen concentration has increased by four times.
6. The C/N ratio fell from 690.11 to 52.12 in just 90 days.
7. The weight of the biomass doubles in a 90-day period

**III percentage changes in the vegetable waste and vermicompost characteristics**

	Name of Parameter	Final Parameter of CompostVegetable waste				Initial Parameterof Vegetable waste	Difference	Percentage Change
		S1	S2	S3	Mean			
	WE: WS	1:05:05	1:05:10	1:05:15				
1	%Organic	43.45	44.87	56.76	48.36	150	101.64	67.76
2	%ChemicalOxygen	13.4	15.7	21.43	16.843	287.53	270.68	94.13
3	%N	0.11	0.25	0.38	0.246	3.8	3.54	93.15
4	%Ca	0.675	0.343	0.211	0.403	1.43	1.02	71.81
5	%Mg	0.160	0.343	0.276	0.259	1.73	1.47	85.02
6	%Na	0.673	0.376	0.334	0.461	13.45	12.98	96.7
7	%K	0.86	0.43	0.46	0.583	2.038	1.45	71.39
8	%C/N Ratio	66.8	42	47.6	52.133	690.1	637.96	92.22
9	pH	6.7	6.43	6.78	6.636	7.37	0.73	9.95
10	% Incr. in Wt. of Earthworm	100.6	100.2	97.6	100	50	50	50
11	%Recovery Of Ver.compost	44.92	25.42	26.16	32.16	100	67.84	67.84

## V. CONCLUSION

The following conclusions can be drawn from the discussion above:

- i. The samples' organic stuff is totally disposed of. Additionally, vermicompost, which is made from the leftovers after vermicomposting, is a superior kind of agricultural manure.
- ii. As a result of this research, we may employ vermicomposting to get rid of organic waste that has accumulated in the Sukali facility. If we dispose of garbage this way, waste disposal will grow significantly, and people will receive high-quality compost for use in agriculture.
- iii. Vermicomposting is an incredibly simple and cost-effective way to control the breakdown of solid waste, because it takes less time, and the end result may be applied to agriculture.
- iv. In Betul, 71% of the population works in agriculture. Vermicomposting might therefore become a farming-related side business. Farmers can use vermicompost as manure with it.

## VI. FUTURE SCOPE AND STUDY

Improper handling of municipal solid waste has a number of implications. The study has demonstrated successful vermicomposting and improved worm interactions, which may further shorten composting time and increase compost quality. Vermicompost is an organic fertilizer and soil conditioner that is high in nutrients. It is humus-rich excreta from earthworms. Verm wash and vermicompost are also utilized as side products. The industry must be made aware of the value of addition in terms of environmental management while also realizing the need for cost-effective methods to increase the waste management system's efficiency. therefore, advantageous for the management of municipal solid waste. Vermicomposting is therefore advantageous for the management of municipal solid waste.

## REFERENCES

1. Environmental Status Report of Betul City, Betul Municipal Corporation, Office of Public Health Officer, BMC, Madhya Pradesh, India.
2. Singh, R., and K. Pradhan, 1981, "Determination of nitrogen and protein by the Kjeldahl method," Forager Vermicomposting is therefore advantage for the management of municipal solid waste.
3. B.C. Punmia's Wastewater Engineering, vol. II, pp. 591- 592
4. Biswas AK, Kumar S, Babu SS, Bhattacharyya JK, and Chakrabarti T. Environmental quality studies in and around municipal solid waste dumpsites Recycling Resources 55, pp.129–134 (doi: 10.1016/j.resconrec.2010.08.003)
5. "Estimation of organic carbon by the chromic acid titration method", J.A. Walkey and I.A. Black, 1934.
6. National Environmental Engineering Research Institute, Nagpur, Maharashtra state, India, NEERI Report on "Strategy Paper on Solid Waste Management in India" (1996)
7. Biswas AK, Kumar S, Babu SS, Bhattacharyya JK, and Chakrabarti T. Environmental quality studies in and around municipal solid waste dumpsites Recycling Resources 55, pp.129–134 doi: 10.1016/j.resconrec.2010.08.003)



SJIF Scientific Journal Impact Factor

Impact Factor: 8.423



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details