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Study of vermicomposting of organic waste generated from hotels using earthworm species, *Eudrilus eugeniae* and *Eisenia foetida*

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Abstract- Solid waste management is the biggest environmental challenge the world is facing today due to the increasing population and urbanization. A sustainable eco-friendly approach to treat and process organic waste to produce useful nutrient rich vermicompost by using earthworms.The present study was carried out for the utilization of organic waste generated from hotels for the production of vermicompost. The organic raw waste was processed by two species of earthworms namely, *Eudrilus eugeniae* and *Eiseniafoetida* and vermicompost was produced by heap method. The physicochemical analysis of vermicompost revealed significant increase in the moisture, pH, electrical conductivity, N, P, K, Ca, Mg, S and Zn over control. This indicates that vermicomposting is good alternative for conversion of biodegradable waste into organic manure. As compare to *E. foetida*, the *E. euginae* worked vermicompost showed more enrichment of the nutrient parameters.

***Key Words*:**organic kitchen waste, *E. eugeniae*, *E. foetida*, Vermicomposting.

I INTRODUCTION

With the advent of industrialization and energy based intensive agriculture, chemical pathways for raw material conversion became predominant. The damaging long term environmental impacts and resource depletion indicate unsustainability of the current methods. In India, most of the municipal solid waste is dumped and only a fraction (less than 10%) is intermittently processed. The volume of waste generated is posing great threat to the environment. Urbanization, encroachment of fertile area and booming population are also leading to generation of massive amount of waste (Sharma *et al*., 2005) [15].

In India solid waste disposal is done through land filling. Suitable locations for land fill are becoming increasingly difficult to find. Disposal of waste by this method has potential environmental problems. Solid waste may be a solid or semi solid material resulting from human and animal activities. This includes garbage, rubbish, sewage, agricultural waste, ash, dead animals and industrial wastes including chemicals, paints and wastes from agro industry and food waste from hotels (Purohit*et al*., 2004) [11].

Vermitechnological process can provide a solution for safe handling of organic biodegradable solid waste for sustainable productivity (Kulkarni, 2017) [6]. Neha Arya and Katariya (2018) [7] studied the vermicomposting method for conversion of organic solid waste into vermicompost and stated that vermicompost is more efficient as compare to compost. Vermicompost helps to enhance the quality and nutrient content of the product which can be used for further application. It is well established that the vermicompost produced from organic waste containing nutrients in the form which are readily taken up by the plants such as soluble potassium exchangeable phosphorus, nitrates, calcium, magnesium etc. (Parthasarathi, 2008) [8].

Ramos *et al*., (2009) [13] studied the characteristics of *Eiseniafoetida* in polycyclic aromatic hydrocarbon contaminated soils amended with sewage and vermicompost and stated that the earthworms survived in contaminated soil and accumulated only certain amount of contaminants. Singh *et al*., (2014) [16] produced vermicompost from crop residue and farm yard manure by employing *E. foetida* and *P. excavates*. PremSudha and Malathi (2016) [10] converted the hotel food waste into organic manure with the help of earthworms and microorganisms.

II MATERIALS AND METHODS:

The experiments have been designed to understand the processing oforganic kitchen waste generated from hotels. Earthworm species *Eudriluseugeniae* and *Eiseniafoetida* were used to produce vermicompost. Before vermicomposting, the Organic Raw Material of hotel waste is partially decomposed by using a fungal decomposing culture before processing by earthworms. The entire process of partial decomposition took 90 days. During this decomposition, the pit was watered twice at an interval of 7 days. Temperature and moisture were maintained at 32 °C and 70-81 % respectively. The C:N ratio and temperature was recorded periodically. Earthworms were released in to a heap of decomposed organic hotel waste for vermicomposting under a shade in natural conditions.

The ORM and vermicomposts were subjected for physicochemical analysis to understand nutrient composition of final product. All the results were calculated based on three concurrent readings for confirmation and subjected for statistical analysis.

Figure 1: Vermicomposting by heap method.

III RESULTS AND DISCUSSION:

Table 1: Physicochemical parameters of organic waste vermicompost processed by *E. foetida* and *E. eugeniae*.

Parameters	ORM	Vermicompost by *E. foetida*	Vermicompost by *E. euginae*
Moisture (%)	22.1 ± 0.55	36.02 ± 1.08 (62.98%)	37.4 ± 0.74 (69.23%)
pH	7.7 ± 0.11	8.4 ± 0.12 (9.09%)	8.6 ± 0.15 (11.68%)
EC (mmhos/cm)	2.18 ± 0.02	3.26 ± 0.04 (49.54%)	3.29 ± 0.06 (50.91%)
Organic carbon (%)	31.07 ± 1.24	25.29 ± 0.88 (18.60%)	25.45 ± 0.63 (18.08%)
C:N ratio	27.25 ± 0.81	16.31 ± 0.32 (40.14%)	16.10 ± 0.4 (40.91%)

Figure 2 Nutrient content in organic waste vermicompost processed by *E. foetida* and *E. eugeniae*.

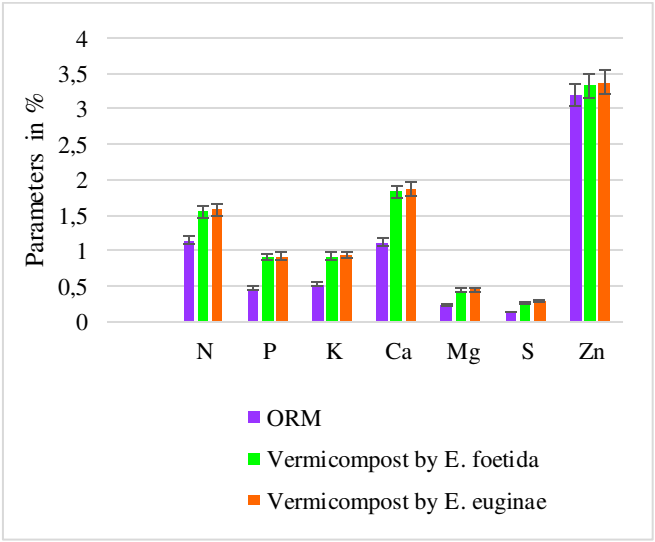

Figure 3: Vermicompost

In the present investigation, the food waste generated from hotel is converted into vermicompost with

the help of earthworms, *E. foetida* and *E. eugeniae*. After physicochemical analysis, significant increase in the parameters was observed in the vermicompost over control (ORM).

The moisture, pH and EC increased in the vermicompost. The organic carbon and C:N ratio was reduced in the end product. This could be due to utilization of and incorporation of carbon and nitrogen by earthworms and microorganism. The Nitrogen content was increased by 35.96% in vermicompost processed by *E. foetida* whereas, it increased by 38.59% in *E. euginae* worked vermicompost when compared with ORM. The phosphorous and potassium content increased by 91.48% and 76.92% respectively in *E. fetida* processed vermicompost. However, it was increased by 95.74% and 8.76% in *E. euginae* worked vermicompost. Likewise, Ca, Mg, S and Zn was reported maximum in the vermicompost processed by *E. eugeniae* by 66.96%, 87.50%, 107.14% and 5.31% respectively. This indicates that when organic matter is subjected for vermicomposting, degradation and mineralization of waste is carried out by earthworms and microorganism which results in the augmentation of nutrients in the final product. The present findings are in agreement with (Balmurugan, 2002 [1]; Pramanik*et al*., 2007 [9]; Klangongsub, 2013 [4]; Rajendran and Thivyatharsan, 2014 [12]; Rosaline *et al*., 2019 [14]) where they have noticed the enrichment of physicochemical parameters in the vermicompost. Varma *et al*., (2017) [17] reported that earthworms are responsible for enhancement of the nutrients in the vermicompost,

Another observation from present work was the earthworm *E. eugeniae* processed vermicompost showed maximum nutrient content when compared with *E. foetida* processed vermicompost. Similar results were also reported by Koteckа*et al*., (2018) [5]. They observed that vermiocompost processed by earthworm, *D. veneta* had higher nutrient value as compare to *E. foeida*worked vermicompost. Rajendran and Thivyatharsan (2014) [12] while studying vermicompsting by using *E. eugeniae*, *P. excavatus* and *E. foetida*, observed that *E. euginae* was more effective than other two.

Bhardwaj and Sharma (2015) [2] also studied the vermicomposting efficiency of different epigeic, endogeic and epi-anecic earthworm species from Haryana. They processed the kitchen waste and crop residue by earthworms, *MetaphirePostuma*, *Perionyxsimlaensis*, *Octocheatons Beatrix*, *Dichogasterbolaui* and *Drawidanepalensis*. After 60 days, they observed that *D.bolaui*and *P. simlaensis* were more effective in decomposition of waste. According to them, different ecological categories and big body size limits the activity for decomposition. Kamalaraj*et al*., (2017) [3] studied the vermicomposting of agro waste by using *P. excavatus* and *E. eugeniae*. They reported that *E. eugeniae* had more growth and reproduction rate as well as decomposition efficiency than *P. excavates*.

IV CONCLUSION:

Vermicomposting of organic kitchen waste from hotels with the help of two exotic species namely *Eudrilus eugeniae* and *Eiseniafoetida* showed significant variation in both macro (Nitrogen Phosphorus Potassium) and in micro nutrients. From the preliminary study, it was observed that as compare to *E. foetida*, the *E. eugeniae*showed better nutrient recovery from ORM. However, further study is required for the confirmation of most suitable earthworm species for vermicomposting.

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