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Studies on Yield Potential of Vermicompost by using *Eisenia foetida* in Different Solid Waste Materials

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A B S T R A C T

The present study was to determine the conversion of six different solid waste materials viz. kitchen waste, paddy straw, leaf litters, *Azolla* plant, *Cyathula* plant and mixed sawdust from local mills into vermicompost and their yield potential by using earthworm species *Eisenia foetida*. 5 kg dry weight of each waste material were mixed with cow dung and allowed to undergo decomposition. The maximum yield of vermicompost were recorded from the leaf litters (3.937 kg dry wt.) followed by *Azolla* plant (3.655 kg dry wt.). The lowest vermicompost yield was recorded from *Cyathula* plant (2.387 kg dry wt.) respectively.

Introduction

With increase in human population and greater demands, there is an increase in production of various types of waste materials viz. agricultural, domestic, city or municipal and industrial. These generated waste materials are disposed without concerning alarming environmental issues causing environmental pollution, affecting ambient air quality, surface water bodies, underground water sources and soil. These give sufficient scope for health hazards, sickening of soil and contamination of air and water. Therefore, the disposal of different types of waste materials has become very important issue for maintaining healthy environment (Senapati and Julka, 1993; Moorthi *et al.*, 2016). The most apparent approach of management is to at least recycle the decomposable organic wastes into a useful product by utilizing earthworm activities. The feeding and general behaviour activities of earthworms like burrowing, micronising, digesting and excreting support the decomposition of biodegradable matters. These activities decompose complex waste matters to simple forms and the process is known as vermicompost.

Vermicomposting is an eco-biotechnological process that transforms energy rich and complex organic substances into stabilized vermicompost (Bentize *et al.*, 2000). Meena and Ajay (2011) use vegetable wastes amended with cattle manure for

vermicomposting. Vermicomposting of kitchen wastes and certain other organic wastes has been proved successful (Daniel and Karmegan, 1999; Suthar, 2009; Alok Bharatwaj, 2010). The promising technique that can be applied to treat the waste materials is vermicomposting by some specific composting worms that have been appeared as key sources to combat the problem of organic waste disposal on a low input basis (Garg and Kaushik, 2005; Suthar, 2007). Hence, the aim of study was to determine the yield potential of vermicompost prepared from different solid waste materials by using *Eisenia foetida.*

Materials and Methods

Collection of earthworm

An identified *Eisenia foetida* species were collected from Central Agricultural University (CAU), Iroishemba and then reared in plastic tubs in vermicomposting shed under natural conditions for further experimental analysis.

Collection of waste materials

6(six) solid wastes viz. kitchen waste, paddy straw, leaf litters, *Azolla* plant, *Cyathula* plant and mixed sawdust from local mills were collected and sundried.

Experimental setup for vermicomposting

The experiment for vermicomposting was conducted in plastic buckets. 5kg dry weight of each 6(six) waste materials with cow dung (4:1 ratio) were put in the plastic buckets and allowed to undergo partial decomposition. Before partial decomposition, paddy straw and *Cyathula* plants were chopped to smaller pieces. Watering was done as and when required. These wastes were allowed to undergo partial decomposition for 15 days. Four replicates of each six waste materials were taken for the experiment. Twenty five adult *Eisenia foetida* worms were introduced in each of the mixture of six waste materials. The vermibeds were covered with gunny bags to maintain the optimal moisture. The experiment was set under shady place to avoid direct sunlight. The vermibeds were monitored day by day.

Once in every 20 days, the top few inches of the bedding is turned over, allowing for escape of any build up gases and to prevent the bedding from becoming too densely packed.

Collection of vermicompost

Harvesting period of vermicompost were different for each six different waste materials. When the topmost layer appears brownish, the compost can then be harvested by scrapping off the upper layer periodically dried and separately stored.

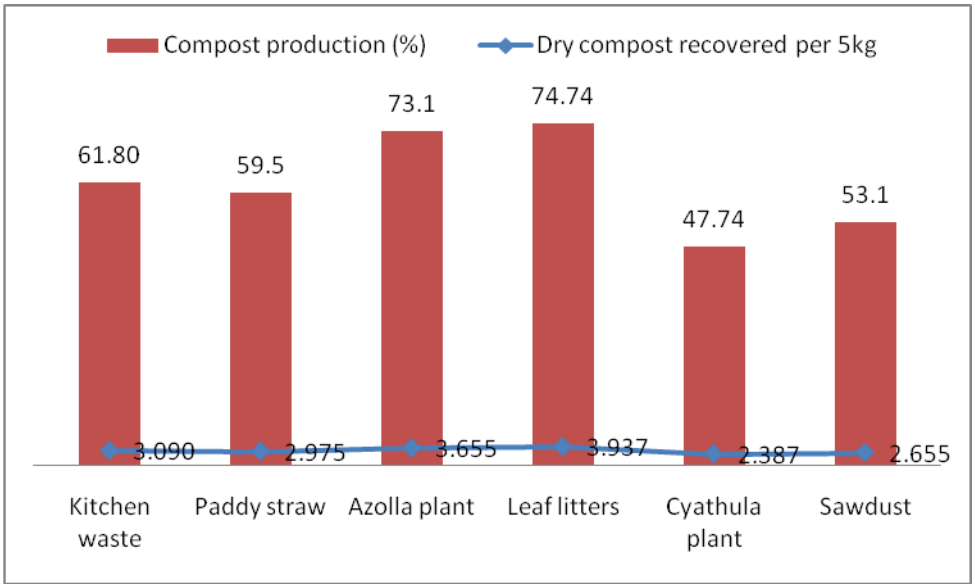
Results and Discussion

The results on the effect of yield potential of vermicompost from six different waste materials are presented (Table1and Fig.1).The highest vermicompost yield were recorded from the leaf litters (3.937 kg dry wt.) followed by *Azolla* plant (3.655 kg dry wt.). The lowest vermicompost yield was recorded from *Cyathula* plant (2.387 kg dry wt.) respectively. According to Ambulkar and Shedkar (2004), the volume of the wastes can be reduced to 50-85% after composting. But still, there is no any reports of exact vermicompost yield from the organic wastes in comparison to the present study. Some workers studied only the conversion of organic wastes into valuable organic manure (Zajonc and Sidor, 1990; Mitchell and Edwards, 1997; Nagavallemma *et al.,* 2006; Yadav and Garg, 2011; Vermi, 2011).

Table.1 Yield potential of vermicompost from various solid waste materials by *Eisenia foetida*

Sl. No.	Name of solid wastes	Initial dry wt. of substrate (kg)	Dry compost recovered (kg)	Compost production (%)
1.	Kitchen waste	5	3.090	61.80
2.	Paddy straw	5	2.975	59.50
3.	*Azolla* plant	5	3.655	73.10
4.	Leaf litters	5	3.937	74.74
5.	*Cyathula* plant	5	2.387	47.74
6.	Sawdust	5	2.655	53.10

Fig.1 Yield potential of vermicompost from various solid waste materials by *Eisenia foetida*



So, the outcome of the investigation clearly indicates that most of the solid waste materials have the ability of conversion into high rate of vermicompost yield. In conclusion, from the above study it has been concluded that selected six solid waste materials have the ability to produce high vermicompost yield by using earthworm species. On the other hand, utilization of these wastes channelize to minimize or avoid pollutional effect on the environment, in addition vermicompost exhibit a greater potential as organic biofertilizers for the growth and development of plant and it would earn immense economic benefit.

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