New Wonderful Method of Recycling Verm-Milli Composting. A Study

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Abstract

Widely known ready to use organic fertilizer is vermicompost. Organic waste, when converted into compost becomes a valuable fertilizer. A biological process in which organic biodegradable wastes or debris are converted into hygienic, humus rich product or compost for use as a soil conditioner and an organic fertilizer is composting, when animals are used is biocomposting. If we use earthworm the product is vermicomposting. Macro invertebrates doing the process of composting are microbes, earthworms and millipedes. These organisms utilize the biotechnology known plant and animal debris into a well-processed biofertilizers. A study was planned to elucidate the composting properties of these organisms and the quality of compost known as "verm-milli compost." The millipedes used were Harpaphe haydeniana, Xenobolus carnifex and the earthworm Eisenia fetida. An attempt was made to understand the efficacy of verm-milli compost in different combinations. The results are discussed.

Keywords: Vermicompost, verm-millicompost, Harpaphe haydeniana, Xenobolus carnifex, Eisenia fetida and bioconversion.

1. Introduction

An environmentally sound technology of the present scenario is biocomposting. Increased human population led an increased accumulation of wastes. Soil health restoration is important now. This biocomposting improves soil structure, texture, aeration and increases water holding capacity and production of nitrogen, potassium and phosphorous of the soil. Macrodetritivore arthropod feeds on decaying organic matters are millipedes and Macroinvertebrates compost organic debris are earthworms.

A key component in nutrient cycling of soil are earthworms and vermicomposting is an eco-friendly technique. According to Ambarish and Sridhar (2013) two step composting using *Arthrosphaera* followed by earthworms may e more profitable and provide new insight into the organic manure production and utilization. Studies of JJM and Revathy (2017) placed an insight about high nitrogen in the verm-milli compost proves that this compost technology help in the recycling process for the betterment of society.

Transformation of biodegradable wastes into stable organic manure for agriculture shown beneficial effects as improved soil ecosystem. Literature available in this area are scanty. Hence a study was planned to compare and identify the quality of verm-milli compost, vermicompost and millicompost.

2. Materials and Method

2.1.Biology of the composting organisms

Three organisms in different combinations were utilized for this study. They are millipedes such as *Harpaphe haydeniana* and *Xenobolus carnifex* and earthworm *Eisenia fetida.*

The millipede *Harpaphe haydeniana*(Wood,1964) belongs to the class- Diploploda, order - Polydesmida and family – Xystodesmidae. The body is black and is distinctively marked along the sides with patches of a yellowish colour. *Harpaphe haydeniana* reach a length of 4-5 centimeters (1.5-2.0 in), when mature and live for 2-3 years.(Fig.1)

Fig:1. *Harpaphe haydeniana*

Xenobolus carnifex is the millipede (Fabricius,1775) belongs to the class Diplopoda order Spirobolida and family Pachybolidae. The body segment of *Xenobolus carnifex* is black with a broaden median band of dark pink colour. Adults have exactly fifty segment and an average length of 60mm and mid segment width of mm.(Fig.2)

Fig.2: *Xenobolus carnifex*

Eisenia foetida (Savigy, 1826) is a common cultureable epigenic earthworm species which are prolific feeders and can feed on wide variety of degradable organic wastes.(Fig.3)

Fig.3: *Eisenia foetida*

2.2.Collection and maintenance

The adults of *Harpaphe haydeniana* were collected from the moist soil in Thanjavur (10.08°N 79.16°E) and maintained in laboratory with moist soil for about two weeks.

Adult *Xenobolus carnifex* were collected from tree holes in Thanjavur (10.08°N 79.16°E) and acclimatized in the laboratory for two weeks.

Adult *Eisenia foetida* were collected from Periyar Maniammai farm and acclimatized in the laboratory.

2.3.Preparation of bed

Cow dung, tea wastes, leaves and sugarcane trashes were used as raw materials collected from different places dried, ground and powdered. Beds were prepared in seven rounded culture troughs of equal size(25 cm height; 30 cm diameter).

Dried powdered material was added uniformly in all troughs water was sprinkled over the beds to hold moisture 60-75% and kept for 2 to 4 days. Then the end of fourth day, the organisms were introduced as per schedule (Table.1) The experimental was conducted for 45 days. Appropriate moisture was maintained throughout the experimental period. All the troughs were covered with muslin cloth to prevent the invasion of foreign materials and outgoing of millipedes. After 45 days of the period, the soil was analyzed.

Table 1. Experimental schedule

No.	Schedule
I	Control
II	Yeast
III	*Harpaphe haydeniana*
IV	*Xenobolus carnifex*
V	*Eisenia foetida*
VI	*Harpaphe haydeniana*+ *Xenobolus carnifex*+ *Eisenia foetida*
VII	Yeast+ *Harpaphe haydeniana*+ *Xenobolus carnifex*+ *Eisenia foetida*

2.4. Laboratory analysis:

(A) Physico-chemical Parameters

(a) pH: pH of the soil and organic samples were measured using standard pH meter in 1:2 (soil: water) ratio**.**

(b) EC: Electric conductivity of the given samples were measured by conductivity meter (EC machine) in 1:2 (soil: water) ratio.

(c) Organic Carbon: O.C. was determined by the titration method.

(B) Chemical Parameters

(a) Nitrogen (N)

Available Nitrogen of the samples was determined by Potassium permanganate (KMnO4) Method.

(b) Phosphorus (P)

Phosphorus was determined with the help of 0.5 M Sodium Bicarbonate as extranatent and Ammonium Molybdate for determination with the help of Spectrophotometer.

(c) Potassium (K)

Determination of Potassium of the organic samples were done with 1 N Ammonium Acetate solution using Flame Photometer.

(d) Calcium and Magnesium:
Determination of Calcium and Magnesium were done collectively using Complexometric Titration Method using ethylene diamine tetra – acetic acid (EDTA), first introduced by Schwartzenbach et al. [6].

3. Results

After the study the results were tabulated. Physio-chemical parameters of the respective compost were presented in the table (Table.2). Changes in the parameters studied were noted in the experimental compost. Marked change was observed in the mixed compost that is the trough with yeast, *Harpaphe haydeniana, Xenobolus carnifex and Eisenia foetida.* The compost is verm-milli compost. Very high nitrogen, phosphorus, sodium, potassium, calcium and magnesium content was observed in the 7th trough when compared with control and others.

Table 2. Physio – chemical parameters

S.No	Physico Chemical Parameters	Control	Yeast	*Harpaphe haydeniana*	*Xenobolus carnifex*	*Eisenia foetida*	*Harpaphe haydeniana+ Xenobolus carnifex+ Eisenia foetida*	Yeast+ *Harpaphe haydeniana+ Xenobolus carnifex+ Eisenia foetida*
1	**pH**	**6.76**	**6.33**	**6.63**	**6.73**	**7.23**	**7.4**	**7.36**
2	**EC (dS M-1)**	**0.43**	**0.65**	**0.418**	**0.41**	**0.245**	**0.386**	**0.416**
3	**Organic Carbon (%)**	0.53	0.65	0.543	0.623	0.636	0.813	0.853
4	**Available Nitrogen (Kg ha-1)**	283	293.3	291	296	312	514	565
5	**Phosphorus**	7.86	8.45	8.35	8.86	12.36	22.48	23.73
6	**Pottasium**	10.4	11.24	10.13	10.97	18.42	44.65	45.25
7	**Sodium**	9.31	11.87	10.97	11.2	19.23	24.15	26.25
8	**Calcium**	11.2	14.24	13.29	14.04	18.26	27.67	28.65
9	**Magnesium**	44.3	45.75	45.42	48.7	51.23	75.35	78.49

4. Discussion

Millipedes have considerable role in altering the pH a little but the earthworms slightly higher than millipedes. Others nutrients are relatively higher in the vermicompost. But all the parameters studied showed more elevations in the mixed compost, the verm-milli compost. In this experiment a slight addition of yeast enhances the process and the compost seems productive. Hike in the nutritive content (Fig:4 & Fig:5) shows that the mixed combination of earthworm and millipedes hasten the process of bioconversion and increases the quality of the compost. This study coincides the study of Karthigeyan and Alagesan (2011). They proved that the millipede compost derived from leaf litter residues possessed better nutritional content than other organic residues. Prem Apurva et.al (2014) concludes that plant nutrients were more in Millicompost as compared to Vermi-compost.

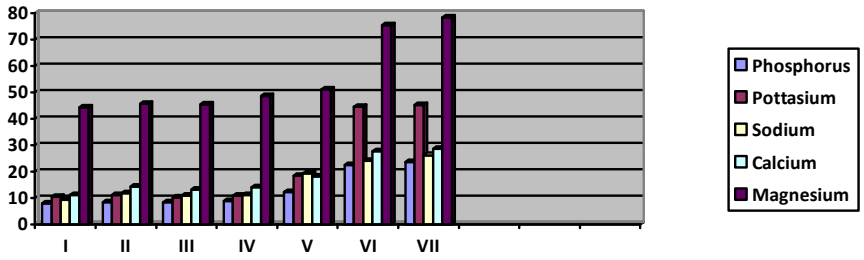

Figure 4. Phosphorus, Potassium, Sodium, Calcium and Magnesium in Different compost.

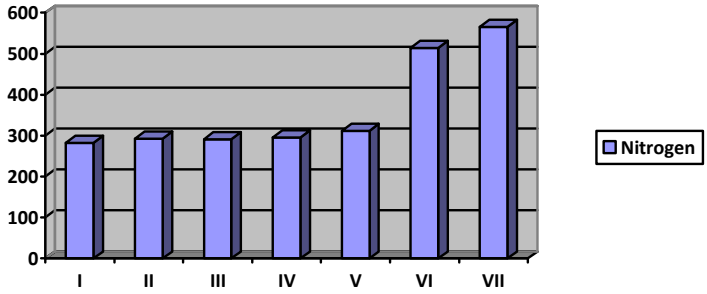

Figure 5.Nitrogen content in Different Samples

Aswini and Sridhar (2006) reported the increase in the concentration of nitrogen, phosphorus, potassium, calcium and magnesium in compost produced by millipedes and earthworm. Prabhas et.al (2011) elucidates that millicompost is superior and has a positive effect on plant growth over vermicompost and ordinary compost. This study proves the best effect of verm-milli compost with high potency. Practicing verm-milli composting proves high challenges in near future.

5. Conclusion

Vermicomposting is the common bioconversion method utilized by the farmers. Millipedes are macroinvertebrates doing the bioconversion process. This study elucidates the role of millipedes and earthworms in the bioconversion of organic soil and debris. The resultant product of bioconversion is a valuable fertilizer. The compost prepared by the millipedes and earthworms are known as verm-milli compost. This can be utilized for the conversion wastes.

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