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Analysis of Vermicomposting Properties of *Lampito mauritii* Collected from selected areas of Tiruchirappalli district, Tamil Nadu

Periyasamy, M.[1]; Christobher, S.[1]; Suganthi, P.[1] & Sheik Umar Sahith, S.N.* [2]

[1] P.G. & Research Department of Zoology, Jamal Mohamed College (Autonomous), Tiruchirappalli-620020, Tamil Nadu, India.
Email: erljmc@gmail.com

[2] Associate Professor, P.G. & Research Department of Zoology, Jamal Mohamed College (Autonomous), Tiruchirappalli-620020, Tamil Nadu, India.
E-mail: Suganpal2012@gmail.com

***Corresponding Author**

Mr. S.N. Sheik Umar Sahith, M.Sc. NET
Associate Professor,
P.G. & Research Department of Zoology,
Jamal Mohamed College (Autonomous),
Tiruchirappalli-620020
Tamil Nadu, India
Email: suganpal2012@gmail.com

Abstract

Vermicomposting is a simple biotechnological process of composting which converts the waste organic products into manure with the help of Earthworms. Lampito mauritii is a top soil species which produces good quantities of vermicomposting in a suitable environment. In this study, L. mauritti species strains are collected from five different villages (T1-T5) in nearby Tiruchirappalli district and used for vermicomposting production analysis for 60 days. The number and weight of the earthworm are gradually increased due to the availability of nutrients in all the groups. The percentage of vermicompost production is increased in Omandur (T1) and Puthanampatti (T2) i.e. muddy and clay soil strains than other groups.

Keywords: Vermicomposting; *L. mauritii*; Verimbed; Earthworm; strain

1. Introduction

Due to the excessive usage of chemical fertilizers deteriorates the environment through depletion of fossil fuels which liberates CO_2 and acts as a major threat to the world. Chemical Fertilizers turns the soil either non-fertile or reduced fertility nature resulted in soil degradation (Aveyard 1988). Adopting suitable Ecological and Sustainable farming practices can makes the environment more productive (Wani and Lee, 1992, Wani *et al.*, 1995). Earthworm acts as a scavenger and helps in decomposing the dead and decayed organic materials and plays a major role in soil ecosystem by increasing the soil fertility (Vasanthi *et al.*, 2013).

Earthworms belong to Invertebrates and nearly 3600 types of earthworms in the world. Earthworms are mainly divided into burrowing and non-burrowing types. The non-burrowing type earthworm eats 10% soil and 90% organic

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waste materials and converts the organic waste into vermicompost faster than the burrowing earthworms (Nagavallemma *et al.*, 2004). Vermicomposting process is a simple biotechnological process and used to enhance the process of waste conversion. Vermicomposting differs from composting in several ways (Gandhi *et al.*, 1997) where Earthworms acts as a biological alchemy and capable of transforming "garbage" into 'gold' (Vermi Co 2001).

Earthworms constitute more than 80 percent of soil invertebrate biomass. They feed on a variety of organic waste materials and produce "Vermicastings". It contains more microorganisms, organic matter and inorganic minerals in the form that can be used by plants. Nearly 10-15 percent primary production is channelized through earthworms. In absolutely ideal conditions of comfort and ground up, moist food, the herd will recycle their own weight in wastes every 24 hours (Gupta, 2003)

Vermicompost improves growth and yield of crops, vegetables, flowers and fruits in crops (Tara 2003). Earthworms secrete mucus which maintains pH (6.5-7.5) to favor the soil microflora (Kadam 2004) and castings (vermicompost) which are rich in Ca, Mg, K, N, hormones, enzymes and vitamins and certain micronutrients essential for plant growth (Lee, 1985; Bansal and Kapoor, 2000) and promote growth of many important microorganisms like nitrogen fixers and phosphate solublisers (Parle, 1963; Satchell, 1967). It also has the capacity to control certain diseases in plants (Tomati *et al.*, 1985). Sujatha *et al.* (2003) reported that the Earthworm castings in the home garden often contain 5 to 11 times more Nitrogen, Phosphorous and Potassium than the surrounding soil. Castings of earthworm also contain abundant sources vitamins, antibiotics and enzymes such as proteases, amylases, lipases, cellulases and chitinases. The present study is focused to determine the highest vermicompost yielding earthworm strain among five different villages by *Lampito mauritii*.

2. Materials and Methods

2.1. Earthworm Collection

The Earthworm *Lampito mauritii* is a top soil species (Ismail 1997) which belongs to the phylum Annelida, Class Clitellata and Family Megascolecidae. Earthworms (n=75) are collected during rainy and after rainy season by digging and hand sorting method (Bhorgin Lourdmary and Uma 2012) from five villages such as Omandur (T1: Muddy soil), Puthanampatti (T2: Clay soil), Thiruvallarai (T3: Red Soil), Kariyamanikam (T4: Red Soil) and Pullivalam (T5: Clay soil) in nearby Tiruchirappalli district. Earthworms are acclimatized in the suitable environment. The average size of the earthworm collected from each village is 12±2.5cm and weighs about 1.8±0.55gm. Earthworm identification is performed in the Nehru Memorial College, Puthanampatti, Tamil Nadu.

2.2. Vermicompost Formation

Compost is prepared by mixing of dried leaves with cow dung in the ratio of 3:1 allowed the materials to decompose for 25 to 30 days with continuous water spray and stirring. Thin layer of compost (vermifeed) is spread at different length in a cemented Tank (1x0.6x0.6m) with a small hole for water exit. The vermibed is prepared by spreading vermifeed (10kg).

Acclimatized mature earthworm (5nos/kg) *L. mauritii* is inoculated into the vermibed through the cracks developed during the evolving of heating due to the decomposition and maintained for 60 days with periodical water spray to maintain adequate moisture and body temperature of the earthworms. The growth and

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production of earthworms and vermicompost are calculated at the end of 60th day.

3. Results and Discussion

Vermicompost collected from each group show variations in their colour as dark black to dark brown and light in weight. The rate of growth of *L. mauritii* is observed at four intervals every 15 days. The number and weight of the earthworms are measured (Table 1). The results showed that number of earthworms is increased in Omandur (T1) and Puthanampatti (T2) in 60th day observation than other groups (Figure 1a) and consequently the weight of the earthworms is also increased at the end of the 60th day in T1 and T2 groups (Figure 1b).

Shweta and Mamtha (2001) studied the qualitative variation in vermicompost prepared from different feed substrates on selected earthworm species. Cow dung, kitchen waste, leaf litter samples are used individually and in combinations with two different earthworms, *E. fetida* and *L. mauritii*. Earthworms digest the organic matter and their excretory products (vermicast) can induce excellent plant growth (Arancon *et al.*, 2006).

Presence of Organic matter in soil acts as a food source for earthworms which influence their capacity to produce compost where low organic matter content do not support the earthworms population (Edward and Lofty 1977). Table 2 showed the percentage production of vermicompost in five selected area *L. mauritii* strain where Omandur (T1) and Puthanampatti (T2) showed highest yield (Figure 2). Our results are supported by Sinha (2009) findings as vermicompost production is determined primarily by the type of the substrate (raw materials) and species of earthworms used for composting.

4. Conclusion

Analysis of vermicompost preparation by *Lampito mauritii* is done on selected (T1-T5) area soil. Vermicomposting yields are good in all the areas for 60 days. *L. mauritii* species collected from Omandur (T1) and Puthanampatti (T2) showed increased growth and proliferation resulted in high production of vermicompost

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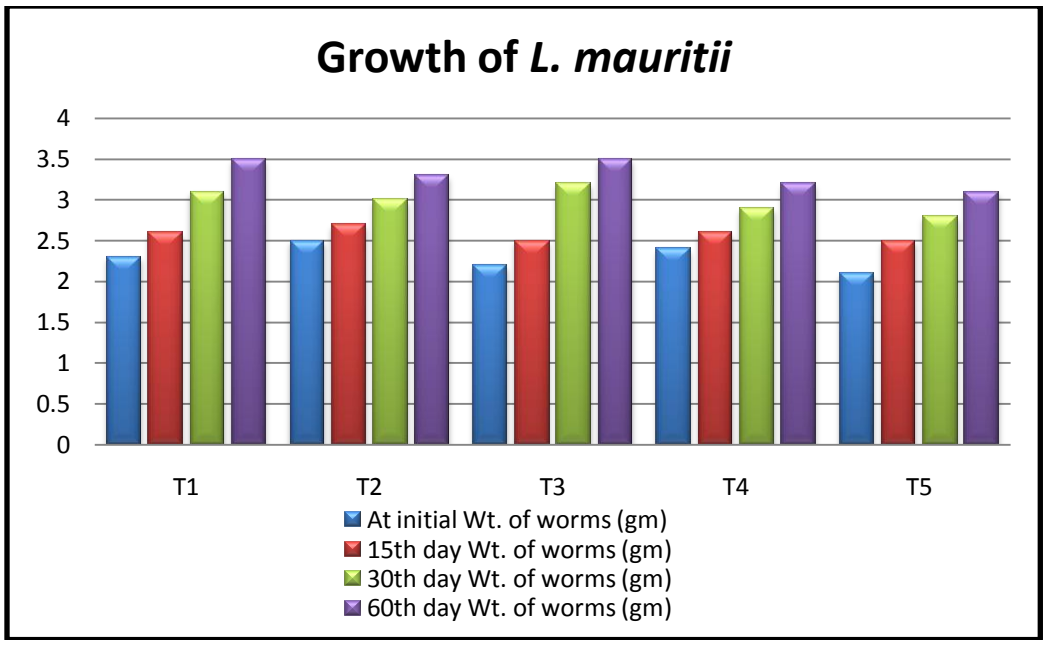
Figure 1. (a) Growth and (b) Weight of *Lampito mauritti* observed at 15 days intervals.



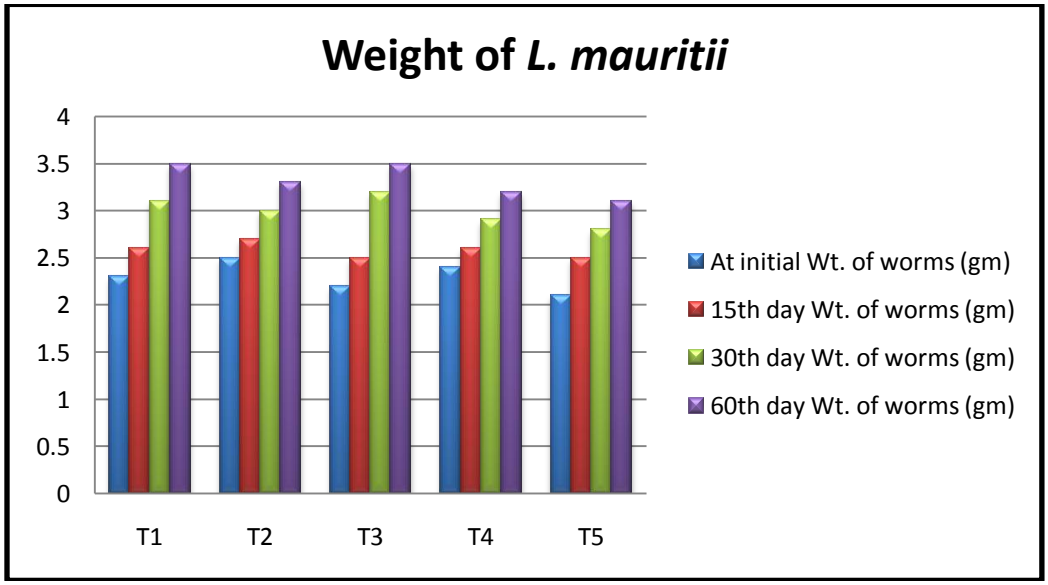


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Figure 2. Total amount of vermicompost production by *Lampito mauritii* during at 15 days interval

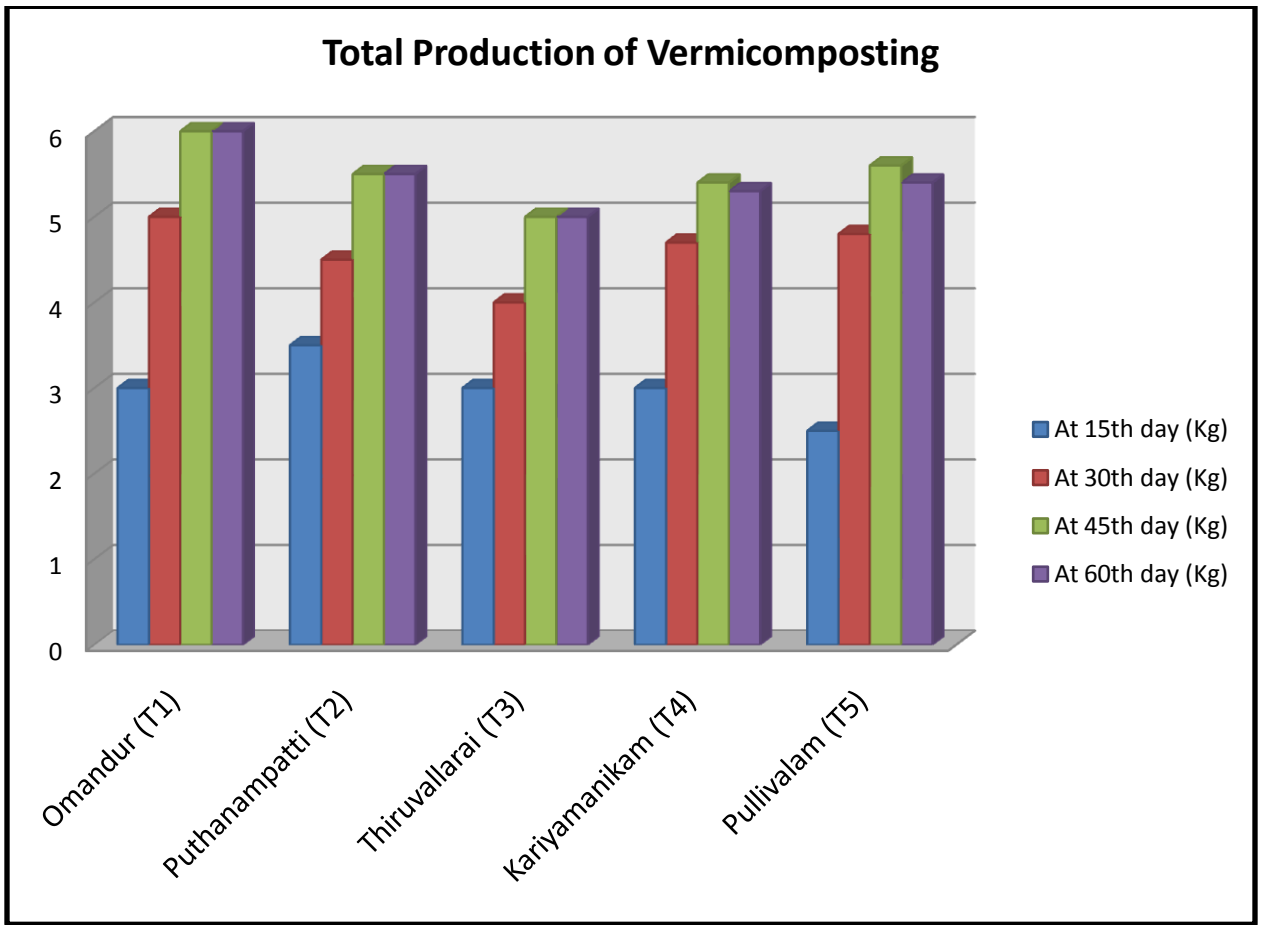

Table 1. Growth of *L. mauritii* in 15th, 30th and 60th days of vermicomposting production

Groups	At Initial		At 15th day		At 30th day		At 60th day	
	No. of worms	Wt. of worms (gm)	No. of worms	Wt. of worms (gm)	No. of worms	Wt. of worms (gm)	No. of worms	Wt. of worms (gm)
T1	50	2.3	68	2.6	71	3.1	75	3.5
T2	50	2.5	53	2.7	59	3.0	65	3.3
T3	50	2.2	52	2.5	53	3.2	60	3.5
T4	50	2.4	50	2.6	51	2.9	55	3.2
T5	50	2.1	52	2.5	53	2.8	58	3.1

T1- Omandur, T2- Puthanampatti, T3-Thiruvallarai, T4-Kariyamanikam, T5-Pullivalam.

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Table 2. Production of vermicompost by *L. mauritti* at different intervals

Groups	At 15th day (Kg)	At 30th day (Kg)	At 45th day (Kg)	At 60th day (Kg)
Omandur (T1)	3.0	5.0	6.0	6.0 (65%)
Puthanampatti (T2)	3.5	4.5	5.5	5.5 (64%)
Thiruvallarai (T3)	3.0	4.0	5.0	5.0 (63%)
Kariyamanikam (T4)	3.0	4.7	5.4	5.3 (62%)
Pullivalam (T5)	2.5	4.8	5.6	5.4 (60%)

Values in brackets () denoting the percentage of vermicompost production