

## ORGANIC WASTE MANAGEMENT THROUGH VERMICOMPOSTING: AN ECO-FRIENDLY NOTION

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### Abstract

As world-wide populations increase, managing waste sustainably has become one of the most pressing challenges. Among the waste management strategies, vermicomposting emerges as a highly effective, eco-friendly solution. This process utilizes earthworms to transform organic waste into nutrient-rich compost, improving soil quality while mitigating waste disposal issues. This article explores the factors influencing vermicomposting, optimal conditions for its success, and the role of different earthworm species in achieving effective composting outcomes.



### Introduction

The exponential growth in human population has intensified the problem of waste disposal. Reports indicate that approximately 38 billion metric tonnes of organic waste are generated globally each year, with India contributing around 100,000 metric tonnes. Predictions suggest that this figure could escalate to 260 million tonnes by 2047 unless sustainable waste management solutions are adopted. Historically, Aristotle described earthworms as “the intestines of the soil.” Modern science validates this observation, as these organisms play a pivotal role in converting organic material into fertile soil amendments through vermicomposting. This process is particularly suitable for countries like India, where it aligns with the principles of low-cost and eco-friendly waste management.

### History of vermicomposting:

Earthworms have been on the Earth for over 20 million years. In this time, they have faithfully done their part to keep the cycle of life continuously moving. Ancient civilizations, including Greece and Egypt valued the role earthworms played in soil. The Egyptian Pharaoh, Cleopatra said, “Earthworms are sacred.” Charles Darwin was intrigued by the worms and studied them for 39 years. Referring to an earthworm, Darwin said, “It may be doubted whether there are many other animals in the world which have played so important apart in the history of the world.”

In the era of Green Revolution, where intensive agricultural practices, increased our food production but over a period of time, the excessive use of chemical fertilizers and pesticides for increased productivity has led to degradation of the soil. Consequently, there has been decline in productivity. It was then that the disadvantages of pesticides and inorganic fertilizers came to light. Henceforth, the oldest form of agriculture now called organic or natural agriculture started being advocated. Vermicomposting is one such method of

organic farming where earthworms, the friends of farmers convert the agricultural waste into compost. It also enhances the fertility and productivity of the soil.

### Understanding Vermicomposting: -

Vermicomposting, derived from the Latin word “vermi” (worm), involves the cultivation of earthworms (vermiculture) to process biodegradable waste. The resultant compost is a valuable soil amendment rich in nutrients. The process is influenced by two primary mechanisms:

**1. Mechanical and Physical Processes:** These involve aerating the organic matter and ensuring an even mix with earthworms.

**2. Biochemical and Ecological Interactions:** Microbial activity and earthworm interactions are critical for breaking down organic material into high-quality compost.

### Key Factors in Vermicomposting

#### 1. Earthworm Selection

More than 8000 species of the earthworms are found all over the world. Not all the species can be used for vermicomposting. This is because only a few species can adapt themselves to high temperature produced during the decomposition of the organic matter content. Few of such widely used species are *Eisenia fetida*, *Eudrilus eugeniae*, *Lampito mauritii* and *Perionyx excavates* etc.,

Different earthworm species vary in their efficiency for vermicomposting. For example:

***Eisenia fetida*:** It is popularly known as red wiggler or red worm or tiger worm. It is perhaps the most widely used earthworm for vermicomposting as it is favoured for its rapid reproduction and adaptability.



***Eudrilus eugeniae*,** popularly known as ‘Night Crawler, is the second most widely used earthworm for vermicomposting.



***Dendrobaena veneta*:** Suitable for industrial-scale composting but reproduces more slowly than *E. fetida*.



*Perionyx excavatus*: Ideal for tropical regions, this species tolerates higher temperatures effectively.



## 2. Environmental Conditions

**Temperature:** Optimal range is 15–30°C, as extremes can hinder earthworm activity and reproduction.

**Moisture Content:** Earthworms require 70–80% moisture for survival and efficient metabolism.

**pH Levels:** Maintaining a neutral pH (6.5–7.5) prevents acidic conditions that could harm the earthworms.

## 3. Bedding and Additives

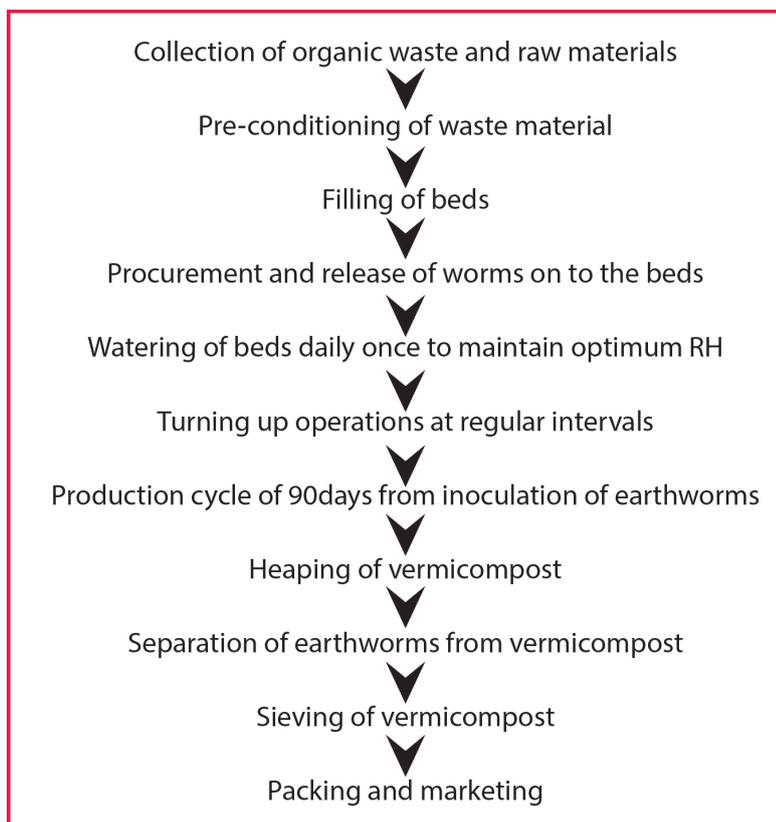
Bedding materials such as dry leaves, vegetable & kitchen waste and cattle manure (dry dung) provide essential nutrients and maintain moisture balance. Additives like crushed eggshells help neutralize acidity, ensuring a conducive environment for composting.

## 4. Designing a Vermicomposting Unit

Vermibeds form the core component of a vermicomposting unit. The beds should be constructed with a height of 75 to 90 cm and equipped with an adequate drainage system to prevent waterlogging. The width of the beds should not exceed 1.5 meters to allow workers to easily access the centre for regular maintenance and harvesting. Ensuring uniformity in bed height is crucial for maintaining consistent production levels across all beds.

### The Vermicomposting Process

The process begins with layering bedding materials, followed by finely shredded organic waste. Earthworms are introduced in phases to ensure optimal decomposition. After 90 days, the material is transformed into nutrient-rich compost, which is sieved and dried for agricultural use.



### Recommended quantity and time of application of vermicompost

Crop	Quantity to apply	Time to apply
Field crops	1 tonne per acre	Last ploughing
Citrus, Pomegranate, Ber and Guava	2 kg per tree	At planting time and before flowering in 1 - 2 years old crop
Mango, coconut	2 kg per tree 5 kg per tree 10 kg per tree 20 kg per tree	At planting time 1-5 year old trees 6-9 year old trees Trees older than 10 years

### Advantages of Vermicomposting

- Enhanced nutrient release and soil structure.
- High nutritional value than normal compost.
- High soil physical properties, chemical and biological properties.
- Macro and micro nutrients were readily available for plant.
- Production of cytokinin and auxins which enhances the plant growth.
- Earthworms release metabolites such as Vitamin B and Vitamin D in the soil.
- Reduced pathogenic organisms in waste.
- Improved germination rates and crop yield.

## Precautions

- \*Always settle the vermi-beds under shade.
- \*Avoid water logging.
- \*Maintain optimum temperature and relative humidity.
- \*Protect earthworms from predators (ants, rats, birds).
- \*Avoid using metal or sharp objects during turning-up operations.
- \*Spraying of chemical fertilizers should be avoided.

## Conclusion

I personally conclude that vermicomposting is an environmentally sustainable solution to the burgeoning issue of organic waste. By leveraging the biological capabilities of earthworms, apart from waste disposal challenges, also contributes to agricultural productivity and sustainability. With its adaptability to diverse conditions, vermicomposting holds promise as a cornerstone of sustainable waste management systems worldwide.