

Introduction

In any environment, recycling of the degradable waste is the natural way of replenishing it. Waste is a reusable resource. It is a rich source of food and energy if utilized properly. If not it is polluting, creates health and aesthetic problems. Again if we want India to be in the developed nation in the next few years, importance must be given to waste management which is one of the steps towards sustainable development. Thus it becomes necessary to do composting at home, in the neighbourhood, parks, schools, colleges etc., as already some areas are doing. Efforts should be carried out bringing NGOs, schools and colleges to take part and have a better waste management program.

Composting is an accelerated biooxidation of organic matter passing through a thermophilic stage (45 to 65°C) where microorganisms (mainly bacteria, fungi and actinomycetes) liberate heat, carbon dioxide and water. The heterogenous organic material is transformed into homogeneous and stabilized humus like product through turning or aeration.

Vermicomposting is also a biooxidation and stabilization process of organic material that, in contrast to composting, involves the joint action of earthworms and microorganisms and does not involve a thermophilic stage. Vermicompost is becoming popular as a major component of organic farming system. It is highly useful in raising seedlings and crop production. Vermicompost is stable, fine granular organic manure, which enriches soil quality by improving its physicochemical and biological properties. It is an eco friendly natural fertilizer prepared from biodegradable organic waste and is free from chemicals. It is one of the easiest methods to recycle agricultural / biodegradable wastes and to produce quality compost. The casts are rich in nutrients, growth promoting substances, beneficial soil micro flora and having properties of inhibiting pathogenic microbes. It helps in cost effective and efficient recycling of animal wastes, agricultural residual and industrial wastes using low energy.

Earthworm is a tube shaped, segmented worm found in the phylum annelida. The key role of earthworms in improving soil fertility is well known. Earthworms live in soil and feed on decaying organic waste like vegetable peels. Earthworms consume biomass, and excrete it in digested form called **worm cast** i.e. the organic manure, which is rich in humus. Worm casts are popularly called as Black gold. Earthworm not only converts garbage into valuable manure but keep the environment healthy.

Earthworms feed on any organic waste and consume two to five times their body weight. After using 5-10 percent of the feed stock for their growth, they excrete the mucus coated undigested matter as worm cast. Worm cast consists of organic matter that has undergone physical and chemical breakdown through the activity of the muscular gizzard which grinds the material to a particle size of 1-2 micron.

Thus earthworm is a boon to minimize the pollution caused by mismanagement of organic wastes. However, not all of the earthworms are useful for vermicomposting. Therefore it is essential to use appropriate species of earthworms for proper management of waste material.

Types of earthworms

There are more than 1,000 different earthworm species, but they can be placed into one of the following three groups depending on feeding and burrowing habits:

1. Epigenic (Epi-Top, Genic-Earth)

They are also called as surface dweller. These earthworms live on the upper part of the soil. These are not burrowing earthworms, but survive by feeding on soil litter. They have pigmented body. These species do not ingest large amount of soil. *Eisenia foetida* is the most prominent member of this group. These are small in size. They are red to brown in colour.

2. Endogenic (Endo-Inner, Genic -Earth)

They are also called as soil dweller (deep10-50). These Earthworms are completely burrowing. They live in upper 2 to 3 inches of soil. They have no pigmented body. They create horizontal burrows and feed on material present deep within the soil surface. They are also small in size. They have a pale appearance. These species ingest large amount of soil that they mix with digested crop residue in their guts. *Allolobophora chlorotica* is the most prominent example of this group.

3. Anecic

They are also called as deep soil dwellers (deep to 2 m). They live in permanent vertical burrows that can be 5 to 6 feet deep. These earthworms need surface crops residue to live. Their burrows remain open. These species ingest substantial amounts of soil that they mix with digested

residue in their guts. Their excrement is primarily deposited at the surface of the soil. The night crawler *Lumbricus terrestris* is most prominent member of this group. These are large in size, and dorsally pigmented. The head is red or brown in colour and tail has a pale appearance as compared to the head part.

Suitable species

One of the earthworm species most often used for composting is the Red Wiggler (*Eisenia fetida* or *Eisenia andrei*). Another breed of worm that can be used is *Lumbricus rubellus* (a.k.a. red earthworm or dilong (China)); but it does not adapt as well to the shallow compost bin as does *Eisenia fetida*. European nightcrawlers (*Eisenia hortensis*) may also be used. Users refer to European nightcrawlers by a variety of other names, including dendrobaenas, dendras, and Belgian nightcrawlers. African Nightcrawlers (*Eudrilus eugeniae*) are another set of popular composters. Blueworms (*Perionyx excavatus*) may be used in the tropics because it is suitable in warmer climates. *Lumbricus terrestris* (a.k.a. Canadian nightcrawlers (US) or common earthworm (UK)) are not recommended, as they burrow deeper than most compost bins can accommodate.

The most common worms used in composting systems are red worms (*Eisenia foetida*, *Eisenia andrei*, and *Lumbricus rubellus*). They feed most rapidly at temperatures of 15–25°C (59–77°F). They can survive at 10°C (50°F). Temperatures above 30°C (86°F) may harm them. This temperature range means that indoor vermicomposting with redworms is possible in all but tropical climates. In the tropical climates Blueworms (*Perionyx excavatus*) may be used.

To conduct our experiment we used *Eisenia foetida*. *Eisenia foetida* is commonly known as red worm, brandling worm, pan fish worm, trout worm, red wiggler etc. This worm thrives in rotting vegetation. The posterior segments of this species do not taper and the final segment is blunt. They have groups of bristles called setae on each segment that move in and out to grip nearby surfaces as the worm stretch and contract their muscles to push themselves forward or backward. When roughly handled, an *Eisenia foetida* exudes a pungent liquid, thus the specific name *foetida* meaning foul smelling.

Eisenia foetida

Systemic classification:

Kingdom- Animalia

Phylum- Annelida

Class-Clitellata

Order-Haplotaxida

Family-Lumbricidae

Genus-*Eisenia*

Species- *foetida*

Objectives of the experiment:

The main objectives of this experiment are:

1. To learn how to make compost from household waste material.
2. To learn how to make vermicompost using one species of earthworms (*Eisenia foetida*).
3. To find out the difference between the two methods – composting and vermicomposting.
4. To find out the % of output.
5. To observe the growth of plants using compost and vermicompost separately.