

## Vermicompost: An Eco-friendly Organic Fertilizer

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The over use of chemical fertilisers following the green revolution has resulted in a number of problems, including serious soil degradation, nitrogen leaching, soil compaction, loss of soil organic matter, loss of soil carbon, and reductions in microbial population. Additionally, over time, chemical fertilisers have become less effective at increasing crop yields. Vermicomposting has been described in this context as a workable, affordable, and quick technique for the effective management of nutrients.

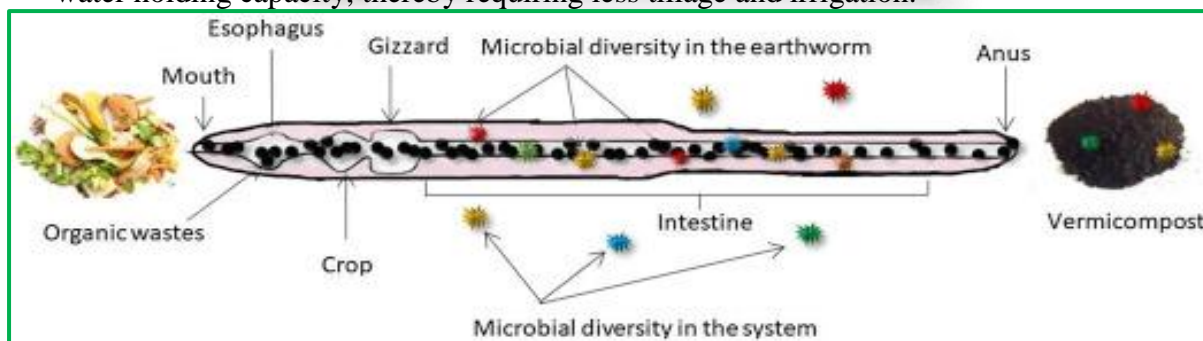
Vermicomposting is a technique used in science to create compost using earthworms. They are frequently found feeding on biomass and excreting it in a digested state while residing in soil. "Worm-farming" is what vermiculture is. Earthworms consume organic waste and excrete "vermicasts" excreta that are nitrate- and mineral-rich and contain phosphorus, magnesium, calcium, and potassium. These are used as fertilisers and to improve the soil.

### Vermicomposting comprises two methods

**Bed Method:** This is an easy method in which beds of organic matter are prepared.

**Pit Method:** In this method, the organic matter is collected in cemented pits. However, this method is not prominent as it involves problems of poor aerat-on and waterlogging. When the earthworm consumes organic wastes, the substrate passes through earthworm's gut and gets digested in the intestine of earthworm with the aid of beneficial microbes. In the intestinal tract, mucus or chemical secretions, enzymes, and antibiotics help in the breakdown of substrate to finely divided peat like material called vermicompost, which is readily available to plants. Hence, vermicompost can be applied as plant growth media or as soil amendments.

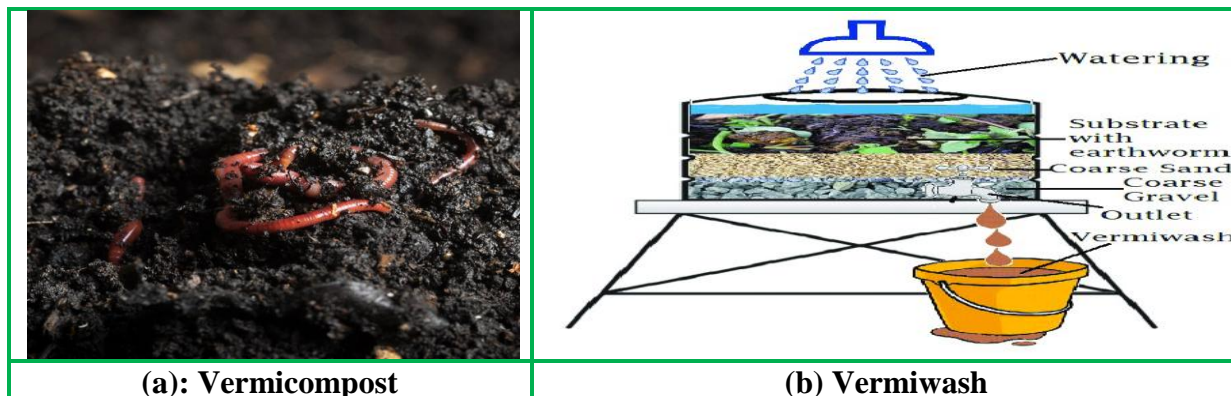
- The presence of vermicompost in soil may act as a soil conditioner by supplying nutrients to plants, lowering C to N ratio, improving the soil texture, increasing soil porosity and water holding capacity, thereby requiring less tillage and irrigation.



Interaction between earthworm and microorganisms in earthworm's gut during vermicomposting

Earthworms can consume organic wastes equal to their body weight per day and the duration taken to break down organic substrates through their metabolic activities (digestion, ingestion, and assimilation) varies according to earthworm species and their density.

Materials for preparation of vermicompost are any types of bio-degradable wastes such as crop residues, weed bio-mass, vegetable waste, leaf litter, hotel refuse, wastes from agro-industries, biodegradable portion of urban and rural wastes.






### Method of preparation

- To prepare compost, either a plastic or a concrete tank can be used. The size of the tank depends upon the availability of raw materials.
- Collect the biomass and place it under the sun for about 8-12 days. Now chop it to the required size using the cutter.
- Prepare a cow dung slurry and sprinkle it on the heap for quick decomposition.
- Add a layer (2-3 inch) of soil or sand at the bottom of the tank.
- Now prepare fine bedding by adding partially decomposed cow dung, dried leaves and other biodegradable wastes collected from fields and kitchen. Distribute them evenly on the sand layer.
- Continue adding both the chopped bio-waste and partially decomposed cow dung layer-wise into the tank up to a depth of 0.5-1.0 ft.
- After adding all the bio-wastes, release the earthworm species over the mixture and cover the compost mixture with dry straw or gunny bags.
- Sprinkle water on a regular basis to maintain the moisture content of the compost.
- Cover the tank with a thatch roof to prevent the entry of ants, lizards, mouse, snakes, etc. and protect the compost from rainwater and direct sunshine.
- Have a frequent check to avoid the compost from overheating. Maintain proper moisture and temperature.
- Among earthworm categories, epigeic earthworms are the most widely used earthworm species in vermicomposting, owing to their tolerance to a wide range of environmental factors (temperature and moisture) and consumption of large amounts of organic wastes daily. These species of earthworms are usually found in top soil, which are rich areas of organic matter and microorganisms. They have short life span, high reproductive rates, easy handling, and thus, serves as potential candidates for vermicomposting.

### Nutrient content of Vermicompost

- Nitrogen:- 1.5 - 2.5%
- Phosphorus:- 0.9 - 1.7%
- Potash:-1.5 - 2.4%
- Calcium:- 0.5 - 1.0%
- Magnesium:- 0.2 - 0.3%
- Sulphur:- 0.4 - 0.5% and other micro-nutrients with vitamins, enzymes and hormones.

**Table 1: Different species of earthworm used in vermicomposting**

	Epigeic Earthworm Species	Endogeic Earthworm Species	Anecic Earthworm Species
Examples	Common red worm <i>Eisenia fetida</i> Red earthworm <i>Lumbricus rubellus</i>	Green worm <i>Allolobophora chlorotica</i> Blue-grey worm <i>Octolasion cyaneum</i>	European nightcrawler <i>Lumbricus terrestris</i> Black-headed worm <i>Apporectodea longa</i>
Characteristic Appearance	Small-bodied (1-7cm); Tend to have light or colorful pigmentation	Small-bodied (2-12cm); Tend to lack pigmentation	Larger-bodied (15-25 cm); Tend to have dark or saturated pigmentation
Dwelling and Feeding Zones	Dwell and feed in the surface soil and above ground in the litter layer; Rarely burrow beneath the uppermost soil strata	Dwell and feed underground; Move horizontally through complex, temporary burrow networks across the topsoil and upper soil strata	Dwell underground, feed both within soil and at litter layer; Move vertically through deep and extensive permanent burrow networks
Composters?	Select species are ideal for vermicompost bins; May be found living in small populations near a backyard compost bin	Not suited for vermicompost bins; May be found in large numbers in the soil beneath a backyard compost bin	Not suited for vermicompost bins; Will enter backyard compost bins during cooling and curing phases
Worm Trivia	Epigeic worms can survive in water with high levels of dissolved oxygen for sustained periods, and are commonly used as fishing bait	Endogeic worms rarely emerge from the soil, and are the only type of worm that actually ingests soil minerals (not just organic matter)	Anecic worms have been recorded at body lengths up to 50cm!
			

Source: - <https://solanacenter.wordpress.com>

### Vermiwash: A plant growth regulator

Vermiwash is the liquid that is collected after water passes through compost made by earthworms. It is rich in plant growth hormones, micro-nutrients, and major nutrients like nitrogen, phosphorous and potassium.

#### Method of preparation

- Take one big bucket and one mug.
- Set up one stopcock on the lower most part of the bucket.
- Put a layer of broken brick pieces of stones having thickness of 10-15 cm in the bucket.
- Over this layer put another layer of sand having thickness of 10-15 cm.
- Then put a layer partially decomposed cow dung having 30-45 cm thickness over it.
- Then put another layer of soil having 2-3 cm thickness.
- Now open the stop cock of the bucket and water the materials taken in the bucket.
- Then put 100-200 nos. of earthworms in the bucket.
- After that, a layer of paddy straw having 6 cm thickness is given.
- Now open the stopcock of the bucket and spray water regularly for a period of 7-8 days.
- After 10 days the liquid Vermiwash will be produced in the bucket.
- Hang one pot with a bottom hole over the bucket in such a way so that water falls drop by drop.
- Every day 4-5 litres of water is to be poured in the hanging pot.
- Keep another pot below the stopcock to collect the Vermiwash. Everyday 3-4 litres of liquid Vermiwash can be collected.

#### Application

- Mix 1 litre of vermiwash with 7-10 litres of water and spray the solution in the leaf (upper and lower side) in the evening at the growing stage of the crop.
- Mix 1 litre of vermiwash with 1 litre of cow urine and then add 10 litres of water to the vermiurine solution and mix thoroughly and keep it over night before spraying. 50 to 60 litres of such solution are to be sprayed in one bigha of land to control various crop diseases.