Smart farmer gets the worm

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Degradation of organic waste using earthworms is one of the recent developments in biological sciences. Earthworms break down complex organic residues into simpler water-soluble substances. In the biodegradation process, earthworms and microbes work together and produce vermicompost.

The species of earthworms that are being used for compost production are *Eisenia foetida*, *Eudrilus eugeniae*, *Perionyx excavatus*, *Lumbricus rubellus* and *Pheretima elongata*.

Earthworms degrade all types of organic waste, such as agricultural waste, animal droppings, weeds, industrial effluents, forest leaf litter, etc. Plants and herbs that are insecticidal or aromatic should be avoided. Residues rich in lignin, like stalk of woody plants, take relatively more time to degrade.

Rich in nutrients

Vermicompost is rich in plant nutrients. It provides vital macro elements such as N, P, K, Ca, Mg and micro elements such as Fe, Zn, Cu, etc. Apart from this, it contains plant growth-promoting substances such as NAA, cytokinins, gibberalins, etc. It also harbours beneficial microflora.

Worms also have the capacity to store heavy metals and pesticides in their tissues. Thus, to a certain extent, they play a role in detoxifying polluted soils, too.

Technique

Pit method: In the initial stage, go for a bed of size of 10x1x0.3 m. The beds should be treated with chlorpyriphos @ 2ml/litre of water to prevent ant and termite problem. After 15 days, fill the beds in layers with organic residues as explained:

First layer—decomposable plant material (bottom of bed); second layer—cowdung/ farm manure/ biogas sludge; third layer—spread earthworms (1000-2000 in number); fourth layer—cowdung/ farm manure/ biogas sludge; fifth layer—dry crop residue/ green succulent leafy material, plus cowdung; sixth layer—thick layer of mulch with cereal straw (top of bed).

Each layer, except the third, should be 3-4-inch thick, so that the bed material is raised above the ground level. Sufficient dry and green wastes should be used. The mulch at the top prevents loss of moisture and acts as a barrier to predators like birds. The beds should be in shade.

Heap method: In this method, composting is done on the ground without the pits. Organic material is piled up on the ground, as in the pit method, the only difference is that the heap gets a dome shape. The suitable size for a heap is 10x1x0.6 m.

Wooden box or brick column: Here rectangular wooden or brick structures (3x1x1 m) are erected above the ground level and the organic material is dumped inside serially as in earlier methods.

These beds have to be watered regularly to maintain a moisture level of 60-80 per cent till the harvest of compost.

Multiplication of earthworms: Earthworms are bisexual, but cross-fertilisation is the mode of reproduction. Adult worms, 15-21 days after copulation, lay cocoons, which look like coriander seeds. The eggs present inside the cocoon hatch into neonates in about 15-21 days. Neonates take 35-60 days to attain adulthood, which is characterised by a swollen band near the anterior part of the body. *Eudrilus eugeniae*, one of the species used for vermicomposting, completes its lifecycle in about 65-80 days. It lays 400 plus cocoons in about 60 days.

Vermicomposting can be tested from a small collection of pellets on the top of the beds around 45-60 days after start. This is indicative of good multiplication of worms in the beds. In about 60 days, the material is degraded completely and vermicompost is ready for harvesting.

The rate of degradation depends on the loading of worms. More the worms, faster the degradation. The heap method, however, has proved to be more effective than the pit system.

Harvesting: After 60-70 days, the beds are ready for harvest. Seven days prior to harvesting, watering of the beds has to be stopped so that the earthworms in the top layers move down for want of moisture.

The beds should be disturbed and the material collected in pyramidal heaps for about 24 hours. The semidried compost from the top of the bed can be collected and sieved to remove any inert material. The concentrated vermiculture (earthworms) that remains at the bottom can be used again for vermicomposting. The compost can be dried in shade (12 hours), bagged and stored.

About 3 tonne of vermicompost can be harvested in two months from 10 beds of 10x1x0.6 m each.

Natural enemies: The important natural enemies of vermiculture are ants, termites, flatworm, centipedes, rats, pigs, birds, etc. Preventive measures include treating of the site with insecticide chlorpyriphos 20 EC @ 2 ml/ 1litre or mixing of neem cakes @ 30 g/ 1kg food while filling the beds.

Rainy and winter season favour faster multiplication of worms than summer. With manipulation of soil temperature during summer by providing shade and regular watering, the rate can be enhanced.

Scope

In several experiments, results have indicated that vermicomposting can substitute inorganic fertiliser requirement up to 50-75 per cent when applied @ 10 t/ha.

Vermiculture can be adopted in two ways: by applying vermicompost @2.5-5.0 t/ha at the time of sowing or in-situ vermiculture, wherein earthworms are directly employed in irrigated crop fields.

In case of horticulture, vermicompost can be applied at the time of planting and subsequently at regular intervals, depending on the age of the tree. In-situ vermiculture can be adopted in case of young as well as grown-up trees by releasing requisite number of earthworms at the tree basin or furrow, where adequate organic waste has to be previously dumped.

In-situ vermiculture is gaining significance in irrigated horticulture crops. Earthworms are introduced in situ @ 50,000-2 lakh/ha in crops in the presence of sufficient organic waste. It is also a popular in sugarcane.

Economics: It has been found in tests that the production cost for 1 tonne of vermicompost and 1,000 earthworms is around Rs 500 and 50, respectively. About 3 tonne vermicompost can be harvested in 10 beds.