Vermicompost – An Effective Option for Recycling Organic Waste

B. Mano Ranjith Reddy and R. Naseeruddin
Teaching Assistant, Polytechnic of Agriculture, Punganur
Assistant Professor, Polytechnic of Agriculture, Punganur, ANGRAU
*Corresponding Author: naseer116@gmail.com

Vermicomposting is a basic biotechnological composting process in which certain earthworm species are utilized to enhance waste conversion and provide a better final product. In some aspects, vermicomposting varies from composting. It is a mesophilic process that employs microorganisms and earthworms that are active at temperatures ranging from 10-32°C. Because the material passes through the earthworm gut, a significant but not fully understood transformation occurs, whereby the resulting earthworm castings (worm manure) are rich in microbial activity and plant growth regulators, and fortified with pest-repellent attributes as well. In short, earthworms are capable of transforming garbage into 'gold' through a type of biological alchemy (Vikram reddy *et al*., 2009).

Vermiculture:

Vermiculture is a scientific way of raising earthworms under controlled conditions. Species include *Perionyx excavatus, Eisenia foetida, Eudrilus eugeniae, and Lampito marutii* are predominately utilised for compost preparation.

Vermi technology

Vermi technology combines vermiculture with vermicomposting. Earthworms will be utilised in the following applications.

1. To promote the growth of fertile soils, soil turnover, plant organic matter decomposition and better aeration and drainage

2. To produce useful goods such as vermicompost, animal feed and vermin wash.

3. To enhance environmental quality, maintenance and environmental monitoring for soil fertility.

Inputs required for vermicompost:

Basic raw material: Any organic material generated in the farm like straw, leaf fall etc.

Starter: Cow dung, Biogas slurry or urine of cattle

Earth worms (Species like *Eisenia foetida*).

Favourable conditions of earth worms in the composting material:

a. pH : Range between 6.5 and 7.5.

b. Moisture: Waste/residues should have 60-70 % moisture.

c. Aeration: 50 % aeration from the total pore space.

d. Temperature: Range between 18°C to 35°C.

Method of Preparation

It is mostly prepared in either pit or heap method. The dimensions either heap or pit are generally 10 x 4 x 2 feet. The length and width can be increased or decreased depending on the availability of material but not the depth because the earthworm's activity is confined to the 2 feet depth only. Shade should be provided above the beds either with a thatched roof or net.

The raw material is spread in layers in the pit. The 1st layer is a bedding material 1" thick with soft leaves/ coir /cane trash, the 2nd layer is 9" thick organic residue layer with finely chaffed material like shed waste, vegetable waste and crop residues while the third 3rd layer is with starter material (dung + water mixture) equal of 2" layer. The waste may be pre-incubated with dung slurry before filling into the pit.

Continue to add the layers up to pile to ground level to protect the worms against natural enemies like ants, lizards, snakes, frogs, and toads etc., Maintain proper moisture and temperature by turnings and subsequent staking. After completely filling, worms are introduced into the pit [$1m^2$=1000 worms or 1kg per tonne of residue]. The pit should be covered with old gunny bags or rice straw and maintained moist by regular sprinkling the water and moisture content of the pit should be maintained at 30-40%. In two months, the entire raw material will be turned into the vermicompost. The turnover of the compost is 75 %

[the total material accommodated in the pit is 1000 kg; The out turn will be 750 kg]. The method preparation as outlined by

Harvesting of the vermicompost from the pit

Stop watering before one week of harvest. All the worms spread across the pit come in close and penetrate each other in the form of balls in 2 or 3 locations. Heap the compost by removing the balls and placing them in a bucket, then the material is sieved in a 2 mm sieve, the material passed through the sieve is called vermicompost which is stored in polythene bags.

Conversion rates: 1000 earthworms may convert 5 kg of waste material per day. 1000 worms weigh about a kilogram

Precautions to be taken

1. Vermicomposting is done under a thatched roof to protect worms against rain and sun.
2. Plastic and glass should be carefully sorted out while adding waste into the pit.
3. Vermicompost should be harvested at the appropriate time
4. Pre-incubated waste may be preferred for filling the pit.
5. Care and protection should be provided against ants, rats and other natural enemies

Advantages of vermicomposting:

1. There will be no immobilization in compost because of the narrow C: N ratio.

2. Vermicompost is rich in nutrients when compared to FYM. Nutrient composition of vermicompost

3. Besides the above nutrients the vermicompost also contains the enzymes like Protease, Lipase, Amylase, Cellulose and other growth-promoting hormones

4. Application is easy because the compost is humified and has a structure of crumb and granular.

5. It is hygienic; pathogens and weeds seeds are destroyed.

6. No loss of nutrients

7. Provides buffering against soil acidity and alkalinity.

8. It improves physical properties better than compost on soil application and Improves water holding capacity of the soil

9. Quality, fragrance and shelf life of flowers and fruits are improved

10. Imparts disease and pest resistance to crops

11. Improves the yield

12. Helps in reducing environmental pollution and ecologically safe.

Application/dosage

The vermicompost recommended dosage for field crops @ 1 t/ha, for horticultural crops @ 5-10 kg/tree and floriculture @ 200g/pot is beneficial for getting good results. The following table displayed the nutritional status of the prepared vermicompost.

S. No.	Nutrient	Content
1	Organic carbon	9.15 to 17.98 %
2	Total nitrogen	1.5 to 2.10 %
3	Total phosphorus	1.0 to 1.50 %
4	Total potassium	0.60-0.80 %
5	Ca and Mg	22.00 to 70.00 m e / 100 g
6	Available S	128 to 548 ppm
7	Copper	100 ppm
8	Iron	1800 ppm
9	Zinc	50 ppm

(Source: Theunissen *et al*., 2010)

References

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