Vermi-compost: A sustainable option for Organic grower

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Introduction

Vermi-composting is a method of preparing enriched compost with the use of earthworms. It is one of the easiest methods to recycle agricultural wastes and to produce quality compost.

Earthworms consume biomass and excrete, it in digested form called **worm casts.** Worm casts are popularly called as **Black gold.** The casts are rich in nutrients, growth promoting substances, beneficial soil micro flora and having properties of inhibiting pathogenic microbes. Vermi-compost is stable, fine granular organic manure, which enriches soil quality by improving its physicochemical and biological properties. It is highly useful in raising seedlings and for crop production. Vermi-compost is becoming popular as a major component of organic farming system.

Vermicomposting materials

Decomposable organic wastes such as **animal excreta**, **kitchen waste**, **farm residues** and **forest litter** are commonly used as composting materials. In general, animal dung mostly cow dung and dried chopped crop residues are the key raw materials. Mixture of leguminous and non-leguminous crop residues enriches the quality of vermi-compost.

There are different species of earthworms like.

1. Eisenia foetida (**Red earthworm**),
2. Eudrilus eugeniae (**Night crawler**),
3. Perionyx excavatus etc.

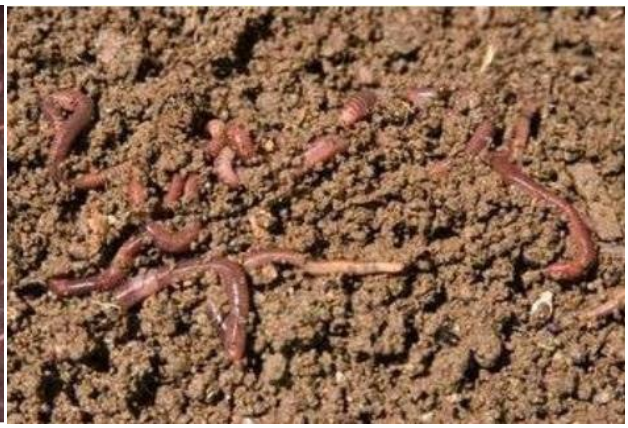
Red earthworm is preferred because of its high multiplication rate and thereby converts the organic matter into vermi-compost within 45-50 days. Since it is a surface feeder it converts organic materials into vermi-compost from top.

Important characteristics of red earthworm (Eisenia foetida)

Characters	**Eisenia foetida**
Body length	3-10cm
Body weight	0.4-0.6g
Maturity	50-55days
Conversion rate	2.0 q/1500worms/2 months
Cocoon production	1 in every 3 days
Incubation of cocoon	20-23 days

Types of vermi-composting

The types of vermi-composting depend upon the amount of production and composting structures. Small-scale vermi-composting is done to meet the personal requirement and farmer can harvest 5-10 tonnes of vermi-compost annually. While, large-scale vermi-composting is done at commercial scale by recycling large quantity of organic waste with the production of more than 50 – 100 tonnes annually.



Methods of vermi-composting

Vermi-composting is done by various methods, among them bed and pit methods are more common.

Bed method

Composting is done on the pucca / kachcha floor by making bed (6x2x2 feet size) of organic mixture. This method is easy to maintain and to practice.

Pit method

Composting is done in the cemented pits of size 5x5x3 feet. The unit is covered with thatch grass or any other locally available materials. This method is not preferred due to poor aeration, water logging at bottom, and more cost of production.

Bed method

Pit method

Process of vermi-composting

- Vermi-composting unit should be in a cool, moist and shady site and proper roof or shed is required for preventing the rain.
- Cow dung and chopped dried leafy materials are mixed in the proportion of 3: 1 and are kept for partial decomposition for 15 – 20 days.

- A layer of 15-20cm of chopped dried leaves/grasses should be kept as bedding material at the bottom of the bed.
- Beds of partially decomposed material of size 6x2x2 feet should be made.
- Each bed should contain 1.5-2.0q of raw material and the number of beds can be increased as per raw material availability and requirement.
- Red earthworm (1500-2000) should be released on the upper layer of bed.
- Water should be sprinkled with can immediately after the release of worms.
- Beds should be kept moist by sprinkling of water (daily) and by covering with gunny bags/polythene.
- Days aeration for proper decomposition
- Compost gets ready in 45-50 days.
- The finished product is 3/4th of the raw materials used.

Flow chart of vermi-compost preparation

Placed the good alluvium soil up to 15 cm height in the constructed tank

⇩

2-3 inches layer of straw, food wastages and leaves should be spread

⇩

2-3 inches of cow dung/ cow dung mixed with straw, leaf etc is spread (15-20 days old)

⇩

Placed the earth worm in number 30-40 per square feet of tank

⇩

Cover the tank with help of wetted jute bag, straw or clothes properly

⇩

Provide sufficient water to moisten the upper layers and covering materials

⇩

Turned the material of tank after each 7 days

⇩

After 7-9 weeks, all material will change into vermi-compost

⇩

Placed 5-10 days old cow-dung at some places in tank for collecting the earthworm

⇩

After that, bring out all the vermi-compost and spread on the plastic or sacks in open air for slight drying

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Then screened the vermi-compost from 2 mm sieve

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Screened vermi-compost should have moisture between 20-25%

⇩

Pack the vermi-compost

Harvesting

When raw material is completely decomposed it appears black and granular. Watering should be stopped as compost gets ready. The compost shout be kept over a heap of partially decomposed cow dung so that earthworms could migrate to cow dung from compost.
After two days compost can be separated and sieved for use.

Preventive measures

- The floor of the unit should be compact to prevents the earthworm's migration into the soil
- 15-20 days old cow dung should be used to avoid excess heat
- The organic waste should be free from plastics, chemicals, pesticide and metals etc.
- Aeration should be maintained for proper growth and multiplication of earthworm
- Optimum moisture level (30-40 %) should maintained
- 18-25^{0}C temperature should be maintained for proper decomposition
- Solidol dust can be sprayed around the vermi-compost tank for preventing the arthworms from ant, snake and insects
- Do not mix vegetables like Onion, lemon, citrus fruits and garlic with vermi-compost

Nutrient content of vermi-compost

The level of nutrients in compost depends upon the source of the raw material and the species of earthworm. A fine worm cast is rich in N P K besides other nutrients.

Nutrients in vermi-compost are in readily available form and are released within a month of application.

Nutrient Analysis of Vermi-compost

Parameters	**Content**
pH	6.8
OC%	11.88
C/N ration	11.64
Total Nitrogen, %	1.02
Available N (%)	0.50
Available P (%)	0.30
Available K (%)	0.24
Ca (%)	0.17
Mg (%)	0.06

Advantages

- There are many advantages of vermi-compost as follows:
- It provides efficient conversion of organic wastes/crop/animal residues.
- It is a stable and enriched soil conditioner.
- It helps in reducing population of pathogenic microbes.
- It helps in reducing the toxicity of heavy metals.
- It is economically viable and environmentally safe nutrient supplement for organic food production.
- It is an easily adoptable low cost technology.

Doses

The doses of vermi-compost application depend upon the type of crop grown in the field/nursery. For fruit crops, it is applied in the tree basin. It is added in the pot mixture for potted ornamental plants and for raising seedlings. Vermi-compost should be used as a component of integrated nutrient supply system.

Crops	**Dose/rate**
Field crops	5-6 ton/hectare
Fruit crops	3-5 kg/plant
Pots	100-200 g/pot

Benefit

Vermi-composting is a highly profitable venture for farmers having dairy units. The approximate cost and benefit under different scale of production is given below.

Scale	Application cost per annum (Rs in Lakhs)	Application benefits per annum (Rs in Lakhs)	Cost/ benefits ratio
Small	0.52	0.90	1:1.73
Medium	1.0	1.85	1:1.85
Large	2.25	4.50	1:2