Technology 3: Vermicomposting Technology for Recycling of Organic Wastes

Methods

In general, there are two methods of vermicomposting under field conditions.

1. Vermicomposting of wastes in field pits.
2. Vermicomposting of wastes on ground heaps

Vermicomposting of Wastes in Field Pits

- It is preferable to go for optimum sized ground pits of 20 feet length 3 feet width 2 feet deep for effective vermicomposting bed.
- Series of such beds are to be prepare at one place.

Vermicomposting of wastes on Ground Heaps

- Instead of open pits, vermicomposting can be taken up in ground heaps
- Dome shaped beds (with organic wastes) are prepared and vermicomposting is taken up.
- Optimum size of ground heaps may be 10 feet length x 3 feet width x 2 feet high.

Materials Required for Vermicomposting

- Farm wastes (straw from wheat, soybean, chickpea, mustard etc.) were used for vermicomposting.
- Fresh dung.
- Rock phosphate (Jhabua RP 30-32% P_2O_5).
  (Note: In the case when vermicompost is to be prepared by P-enrichment technique)
- Wastes: dung ratio (1:1 on dry weight basis).
- Earthworm: 1000-1200 adult worms (about 1 kg per quintal of waste material).
- Water: 3-5 liters in every week per heap or pit.

Vermicomopost Preparation under Tree shade by Pit and Heap Methods

Open permanent pits of 10 feet length 3 feet width 2 feet deep were constructed under the tree shade, which was about 2 feet above ground to avoid entry of rainwater into the pits Brick walls were constructed above the pit floor and perforated into 10 cm diameter 5-6 holes in the pit wall for aeration. The holes in the wall were blocked with nylon screen (100 mesh) so that earthworms may not escape from the pits. Partially decomposed dung (dung about 2 month old) was spread on the bottom of the pits to a thickness of about 3-4cm. This was followed by addition of layer of litter/residue and dung in the ratio of 1:1 (w/w). A second layer of dung was then applied followed by

another layer of litter/crop residue in the same ratio up to a height of 2 feet. Two species of epigeic earthworms viz., *Eisenia foetida* and *Perionyx excavatus* were inoculated in the pit. Moisture content was maintained at 60-70% through out the decomposition period. Jute bags (gunny bags) were spread uniformly on the surface of the materials to facilitate maintenance of suitable moisture regime and temperature conditions. Watering by sprinkler was often done. The materials was allowed to decompose for 15-20 days to stabilize the temperature because to reach the mesophilic stage, the process has to pass the thermophilic stage, which comes in about 3 weeks. Earthworms were inoculated in the pit or heap with 10 adult earthworms (1.160.3 g each) per kg of waste material and a total of 500 worms were added to each pit or heap. The materials were allowed to decompose for 110 days. The forest litter was decomposed much earlier (75 to 85 days) than farm residue (110-115 days).

In the heap method the waste materials and partially decomposed dung (1:1 w/w) are made in heaps of dimension; 10 feet length x 3 feet width x 2 feet high and during inoculation channels are made by hand and earthworm @ 1 kg per quintal of waste are inoculated and then watering is done by sprinkler method. Jute cloth pieces are used as covering material.

P-enriched Vermicompost by Pit and Heap Methods

In the case of phosphorus-enriched vermicompost, Jhabua rock phosphate (30-32% P_2O_5) is used @ 2.5% P_2O_5 of waste material with the same dimension of pit or heap as mentioned earlier. The chemical and biochemical characteristics of vermicompost and P-enriched vermicompost are presented in Table 4.1 and 4.2.

Table 4.1: Chemical composition of vermicompost and P-enriched vermicompost prepared from soybean straw

Parameters	**Vermicompost**	**P-enriched vermicompost**
Ash (%)	51.0	52.5
TOC (%)	27.2	26.5
C/N ratio	14.3	13.6
N (%)	1.90	1.95
$P_2O_{5\,(\%)}$	2.05	4.0
K_2 O (%)	0.80	0.86
WSC (%)	0.94	0.88
Mn (ppm)	500	540
Zn (ppm)	100	100
Cu (ppm)	44	46

Table 4.2: Biochemical characteristics of vermicompost and P-enriched vermicompost prepared from soybean straw

Parameters	**Vermicompost**	**P-enriched vermicompost**
Total phenol	98	100

(mg kg^{-1} compost)		
Dehydrogenase (mg TPFkg^{-1} compost hr^{-1})	40	39
Alkaline phosphatase (mg p-nitrohenol kg^{-1} compost hr^{-1})	490	562
Acid phosphatase (mg p-nitrophenol kg^{-1} compost hr^{-1})	398	421