

## **Materials and Methods**

### **Collection of earthworms:**

The earthworms (*Eisenia fetida*) used in our study were collected from Vermiculture Unit, Kahikushi Agricultural Research Centre (Krishi Vigyan Kendra), Kamrup. We also took some valuable information regarding vermicomposting from this institute.

### **Methods of Vermicomposting:**

Vermicomposting is done by various methods, among which Bed and Pit methods are more common. In our study, we followed the Pit method of vermicomposting Published by ICAR Research Complex for NEH Region, Umiam – 793103, Meghalaya. For comparison of the two methods (composting and vermicomposting), we followed the methods published in the “Manual of On-Farm Vermicomposting and Vermiculture By Organic Agriculture Centre of Canada” written by Munroe (2004).

#### **Bed method**

Composting is done on the pucca/ kachcha floor by making bed (size 6 x 2 x 2 feet) of organic mixture. This method is easy to maintain and to practice.

#### **Pit method**

Composting is done in the cemented pits (size 5 x 5 x 3 feet) or box (size 3 × 3 × 2 feet). The unit is covered with thatch grass or any other locally available materials.

### **Materials Required For Pit Method**

1. Sand.
2. Partially decomposed biodegradable kitchen solid waste (vegetable peels).
3. Partially decomposed cow dung slurry.
4. Wooden powder.
5. Two wooden box (size 3 × 3 × 2 feet) having minute holes for aeration.
6. Black thin plastic sheet.
7. Water.
8. Soil.

9. Thermometer.
10. Two thermocol sheet.
11. Garden sieve.
12. One species of Earthworms, *Eisenia foetida*.

## **Experimental procedure**

Bedding material (biodegradable kitchen solid waste) was first collected on a tray for vermicomposting process. Partial decomposition of these bedding materials were done by spreading the vegetable peels on a tray and dried under sunlight. Drying causes evaporation of water from the vegetables waste resulting in the decrease of the acid content.

Partial decomposition of cow dung has been done by keeping them under sunlight which results in the formation of cow dung slurry.

Two wooden box each of size  $3 \times 3 \times 2$  feet having minute holes for aeration were taken and placed over the thermocol sheet under suitable environmental condition that is without any outbreak of rainfall and heavy sunlight. In between the box and thermocol, soil was spread so that water drainage is absorbed easily.

### **After that following steps were performed to layering the vermicomposting box:**

1. At first a thin layer of sand was spread on the bottom of each of the boxes.
2. After spreading, the partially decomposed vegetable peel has been taken and was placed over the thin sand layer. Sprinkling of wooden powder has been done after this. Wooden powder is made up of carbaceous compound and is a nutrient for earthworm.
3. Partially decomposed cow dung has been taken and placed over the second layer. A little amount of water was added to loosen the decomposed cow dung. Sprinkling of wooden powder has been done after this layer.
4. Alternatively above layer has been repeated except the sand layer up to third times along with the sprinkling of wooden powder.
5. At the top most partially decomposed cow dung layer has been placed over the last layer. Sprinkling of wooden power has been done over it.
6. At this stage the earthworms (*Eisenia foetida*) are released to the compost box.

7. After this little amount of water has been sprinkle for moistening of earthworm bedding.
8. Covering of each box has been done with thin plastic black sheet respectively.
9. Water was sprinkle daily so that the temperature is maintained.
10. Temperature was measure by using thermometer.
11. After every interval of week, mixing of bedding material has been done by mixing bottom layer to top layer so that the earthworm are properly exposed to the vegetable peels.
12. After 60 days, harvesting was done.

Generally after completion of the process, the vermicompost is removed from the bed at regular intervals and replaced by fresh waste materials.

#### **Harvesting of Vermicompost:**

After 60 days (depends up on the size of the pits) the compost was ready as indicated by the presence of earthworm castings (vermicompost) on the top of the bed. Vermicompost can now be harvested from the bin/pit. The compost is ready when the material is moderately loose and crumbly, and the colour of the compost is dark brown. It will be black, granular, lightweight and humus-rich.

To facilitate separating the worms from the compost, the process of watering was stopped two to three days before emptying the beds. This will force about 80 per cent of the worms to the bottom of the bed. Then the worms were separated by using mesh. The earthworms and the thicker material, which remains on top of the mesh, can be put again in the bin to start the process again. If the required environments for the worms are maintained in a cyclic manner then harvesting can be done continuously in cycles.

The smell of the compost was earth-like. Any bad odour if formed is a sign that fermentation has not reached its final goal and that the bacterial processes are still going on. The harvested material is then placed in a heap in the sun. The compost is then sieved before being packed.

**Following precaution has been taken for conducting the vermicomposting experiment:**

1. Only plant-based materials such as grass, leaves or vegetable peelings were utilized in preparing vermicompost.
2. Vegetables with salt or spices were avoided because it increases the acid content which results in the death of earthworms as they respire through skin.
3. Materials of animal origin such as eggshells, meat, bone, chicken droppings, etc. were not used because these are not suitable for preparing vermicompost.
4. Gliricidia loppings, tobacco leaves, onion, garlic, chilli etc. Were also avoided as these wastes are not suitable for rearing earthworms.
5. The earthworms were protected against birds, termites, ants and rats.
6. Adequate moisture was maintained during the process. Either stagnant water or lack of moisture could kill the earthworms.
7. Uses of plastic were avoided as they are non-biodegradable.

## **Methods of Composting**

To conduct this study we followed the method described by Verma (2010). According to this method composting is done by two distinct pathways of biological/decomposition of organic material: Anaerobic digestion and Aerobic digestion.

### **Anaerobic digestion**

Anaerobic digestion is the breakdown of organics in the absence of oxygen under controlled conditions. It is more suitable for waste, which has a high degradable organics.

### **Aerobic digestion**

Aerobic digestion is the biological degradation, vigorous humification and pasteurization of organic residues with the help of air breathing microbes (bacteria, fungi and actinomycetes) under controlled aerobic conditions.

In this experiment, aerobic digestion has been applied for the study of recycling of household degradable waste by natural way using composting method.

## **Materials Required For Composting Method**

1. Wooden box
2. Soil or mud
3. Cowdung slurry
4. Kitchen solid waste
5. Thin black plastic sheet

## **Experimental Procedure**

To prepare compost we followed following steps :

1. An empty wooden box was taken and placed in a suitable area.
2. Kitchen solid wastes are thrown in the wooden box.
3. The waste is covered by a layer of soil to prevent any smell from waste escaping.
4. A layer of cowdung slurry was mixed with the kitchen waste.
5. Water was sprinkled to keep the soil and waste wet.
6. This process was repeated till the pit or the wooden box was filled.
7. When the pit or the wooden box was filled, water was sprinkled at intervals of one or two days.
8. Sprinkling of water was repeated for one month.
9. A small whole at the bottom of the wooden box was done, so that the excess water can be removed.
10. The pit was then covered by a thin black plastic sheet.
11. Temperature was measured by using thermometer.
12. After 60 days, it was observed.

**Following precaution has been taken for conducting composting experiment:**

1. Plant-based materials such as grass, leaves or vegetable peelings were utilized in preparing compost.
2. Materials of animal origin such as eggshells, meat, bone, chicken droppings, etc. were avoided.
3. Adequate moisture was maintained during the process.
4. Uses of plastic were avoided as they are non-biodegradable.
5. The compost was protected from high temperature and rainfall.