SOLID WASTE MANAGEMENT BY VERMICOMPOSTING AT DA-IICT

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1. Introduction

In DA-IICT campus, almost 70% space is occupied by greenery producing huge amount of leaf and plant waste daily. To maintain and to reuse the waste of horticulture products (plants and lawns) and kitchen waste in scientific way, the unit of Vermicompost was commissioned.

“Vermicompost is the product or process of composting using various worms, usually red wigglers, white worms, and other earthworms to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast, also called worm castings, worm humus or worm manure, is the end-product of the breakdown of organic matter by earthworm. These casting have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than the organic matters before vermicomposting.

Vermicompost is an excellent, nutrient-rich organic fertilizer and soil conditioner. This process of producing Vermicompost from green plants and vegetables is called Vermicomposting.”[1]

As part of solid waste management at DAIICT, the process of vermicomposting was followed from a heterogeneous mixture of solid waste like leaf and stem waste of the plants in the campus and waste green vegetable generated from hostel kitchen.

The process of Vermicomposting has been started in July, 2014.
2. Requirement of Vermicomposting at DA-IICT

Following are the primary reasons why DA-IICT requires Vermicomposting as a measure of solid waste management.

- By vermicomposting, the amount of garbage sent to the landfill can be reduced. Transportation cost of transporting the waste from campus to landfill sites is substantially nil.

- Worms produce beautiful black compost called “castings”. It’s a naturally produced nitrogen rich fertilizer. Worm castings contain the microbes that help plants access nutrients and create healthy soil. That’s why it’s one of the best soil additives. It is also used as a fertilizer.

- It makes the environment healthier and vermicomposting deals with our waste in a clean and healthy way. It is used in horticulture and gardening purpose.
3. Literature Survey

The major objective of study was to provide information on raising worms for Vermiculture \(^{[2]}\). In DA-IICT red worms were used to make Vermicompost.

In some cases earthworm culture were used to combine with a composting system \(^{[3]}\).

Used of cow dung was suggested by AAU to make Vermicompost. It also uses plant waste. DA-IICT used waste of plants to make Vermicompost. This is further utilized as fertilizer.

Some studies reported on the use of Vermiculture to restore the health and productivity of agriculture in Cuba. Increase in production of Vermicompost, uses of worm castings in Cuban crops, worm humus production.\(^{[4]}\).

The major objective of some reported work suggests the use of earthworms in maintaining compost out of kitchen waste. Anatomical structure of worms that make them suitable for converting waste to compost \(^{[5]}\).

Some authors offered suggestions on building and operating a habitat for worms called wormitorium that can be used to make compost out of kitchen waste \(^{[6]}\).
4. Methodology for Vermicomposting

4.1 Materials for preparation of Vermicompost

Any types of biodegradable wastes like

- Weed biomass
- Leaf litter
- Waste of horticulture
- Cut vegetables from kitchen

4.2 Phases of vermicomposting

Phase 1: Processing involves collection of wastes, shredding, mechanical separation of the metal, glass and ceramics from it and storage of organic wastes.

Phase 2: Pre digestion of organic waste for twenty days by heaping the material along with cattle dung slurry. This process partially digests the material and fit for earthworm consumption. Cattle dung and biogas slurry may be used after drying. Wet dung should not be used for Vermicompost production.

Phase 3: Preparation of earthworm bed. A concrete base is required to put the waste for Vermicompost preparation. Loose soil will allow the worms to go into soil and also while watering; all the dissolvable nutrients go into the soil along with water.

Phase 4: Collection of earthworm after Vermicompost collection. Sieving is done to separate fully composted material. The partially composted material will be again put into Vermicompost bed.

Phase 5: Storing the Vermicompost in proper place to maintain moisture and allow the beneficial microorganisms to grow\(^7\).
4.3 Vermicompost Production Methodology

➢ **Selection of suitable earthworm**

For Vermicompost production, the surface dwelling earthworm alone should be used. The earthworm, which lives below the soil, is not suitable for Vermicompost production. The African earthworm (Eudrillus eugenial), Red worms (Eisenia foetida) and composting worm (Peronyx excavatus) are promising worms used for Vermicompost production. The African worm (Eudrillus eugenial) is preferred over other two types, because it produces higher quantity of Vermicompost in short period of time.[7]

➢ **Selection of sites for Vermicompost production**

Vermicompost can be produced in any place with shade, high humidity and moderate temperature. If it is to be produced in open area, shady place is selected. It is also necessary that the place is less disturbed by peoples, animals, birds, ants and insects. A thatched roof or green nets may be provided to protect the process from direct sunlight and rain. The waste heaped for Vermicompost production should be covered with moist gunny bags or with the grass wastes[7]. There are three sites of Vermicompost in the shaded place at DAIICT that is made up of grills so that they are protected from birds and sunlight.

Fig. 4.3.1 The red worms are used at DA-IICT.
Vermiculture bed

Vermiculture bed or worm bed (3 cm) can be prepared by placing after the leaf litter and grass wastes in the bottom of tub / container. Vermicompost beds are 2.5 feet wide and length. The distance between beds is 2.5 ft. A layer of fine sand (3 cm) should be spread over the culture bed followed by a layer of garden soil (3 cm). All layers must be moistened with water.

Selection for Vermicompost production

Cattle dung (except pig, poultry and goat), farm wastes, crop residues, vegetable market waste, flower market waste and all other bio degradable waste are suitable for
Vermicompost production. The cattle dung should be dried in open sunlight before used for Vermicompost production. All other waste should be predigested with cow dung for twenty days before put into vermibed for composting. In DA-IICT leaf litter, waste of horticulture (leaves/grass), weed biomass and vegetable waste from kitchen are used for Vermicompost production [7].

- **Watering the vermibed**

  Daily watering is not required for vermibed. But 60% moisture should be maintained throughout the period. If necessity arises, water should be sprinkled over the bed rather than pouring the water. Watering should be stopped 10-14 days before the harvest of Vermicompost [7].

- **Harvesting Vermicompost**

  Earthworms live in the soil and feed on decaying organic material. After digestion, the undigested material moves through the alimentary canal of the earthworm, a thin layer of oil is deposited on the castings. This layer erodes over a period of two months. The process in the alimentary canal of the earthworm transforms organic waste to natural fertilizer.

  ![Fig. 4.3.5 “Castings” final product of vermicompost](image)

  The castings formed on the top layer are collected periodically. The collection may be carried out once in a week. With hand the casting will be scooped out and put in a shady place as heap like structure. The finished compost gets compacted when watering is done [7].
5. **Advantages of Vermicomposting**

- Vermicompost is rich in all essential plant nutrients.
- Provides excellent effect on overall plant growth encourages the growth of new shoots/leaves and improves the quality and shelf life of the produce.
- It recycles the waste of horticulture.
- Vermicompost is free from pathogens, toxic elements, weed seeds etc.
- Vermicompost minimizes the incidence of pest and diseases.
- It enhances the decomposition of organic matter in soil.
- It contains valuable vitamins, enzymes and hormones like auxins, gibberellins etc.
6. Conclusions

1. The more space can be occupied for the Vermicompost unit as per the need as there is ample space in the location where it is located.

2. There is a huge amount of waste created which can be efficiently utilized for the unit.

3. Arrangement for the storage of the compost should be made.
Bibliography


7. Organic farming, Special technologies, Coir compost.