Study on Vermicompost at DA-IICT

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1. Introduction

We have studied on workings of vermicompost at DA-IICT. We have inquired why it is needed at DA-IICT campus, how it works.

In DA-IICT campus, almost 70% space is occupied by greenery. To maintain and to reuse the waste of horticulture products (plants and lawns) in proper way, the unit of vermicompost was established.

There were two options in front of the institute. Firstly use the horticulture waste to convert mechanically into electrical energy and Secondly to produce vermicompost. But there are many necessary things and rules which have to be followed in implementing such mechanical project which is unviable for the institute. So that the unit of vermicompost was implemented and all wastage of horticulture is reused by the process of vermicompost.

The process of vermicompost has been started in July, 2014.

“Vermicompost is the product 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 an earthworm. These casting have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than do organic materials before vermicomposting.

Containing water-soluble nutrients, vermicompost is an excellent, nutrient-rich organic fertilizer and soilconditioner.This process of producing vermicompost is called vermicomposting.”[1]

2. Literature Review

"The basics of Vermiculture" by Lewis & Andrew (2004). The major objective of study was to provide information on raising worms or Vermiculture [2]. In DA-IICT they use red worms to make vermicompost.

"Worms Experiment with Food Waste Diet" by Cornish, Phillip (1999). The major objective of study was to focus on the use of earthworm culture to combine with a composting system [3].

Anand Agricultural University used cow dung to make vermicompost. It also uses plant waste. In DA-IICT they use waste of plants to make vermicompost. This is further utilized as fertilizer.

Vermiculture Offers A New Agricultural Paradigm by Berc et al. (2004). The major objective of the studies was to report 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. INSET: Profile of a Vermicompost Producer [4].

Just add worms by Kaldenbach, Robert (1994). The major objective of studied work suggests the use of earthworms in maintaining compost out of kitchen waste. Vermiculture, Worms ideal for compost, Anatomical structure of worms that make them suitable for converting waste to compost [5].

The home-built wormitorium by Yankee (1994). The major objective of studied work Offers suggestions on building and operating a habitat for worms called wormitorium that can be used to make compost out of kitchen waste [6].

3. Requirements of Vermicompost

Following are the top reasons why DA-IICT requires vermicompost.

- By vermicomposting, the amount of garbage send to the landfill can be reduced.
- Worms produce beautiful black compost called **"**castings**"**.
  It's a nitrogen rich fertilizer and it's not synthetic. Worm castings contain the microbes that help your plants access nutrients and create healthy soil. That's why it's one of the best soil additives on the planet. It is also used in ports 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.

4. Methodology of vermicompost at DA-IICT

4.1 Materials for preparation of Vermicompost

Any types of biodegradable wastes-

1. Weed biomass
2. Leaf litter and plant waste
3. Vegetable waste/kitchen waste

4.2 Phase of vermicomposting

Phase1 : 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. This process partially digests the material and fit for earthworm consumption.

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 the composted material 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

i) 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.

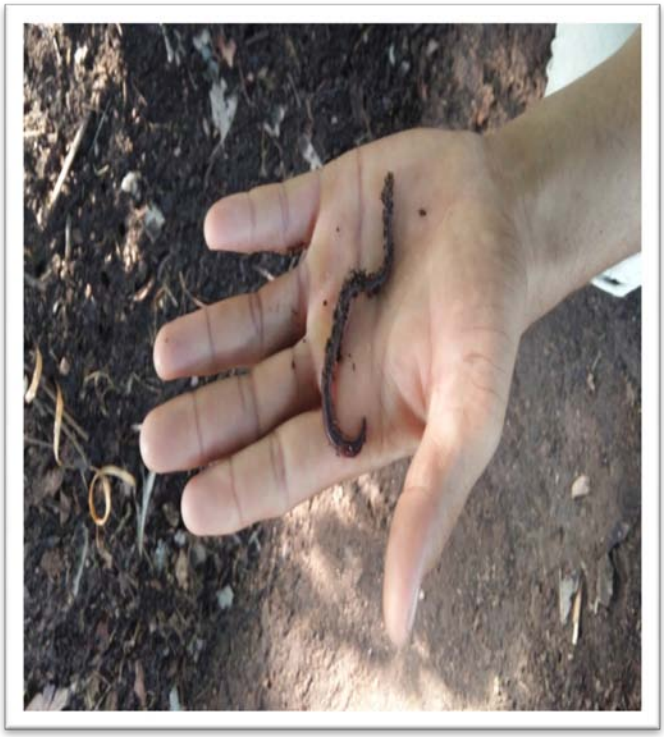

Fig. 4.3.1 The red worms are used at DA-IICT.

The African earthworm (*Eudrillus engenial),* 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 production of vermicompost in short period of time and younger ones in the composting period [7].

ii) Selection of site 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].

Fig. 4.3.2 Site 1 at DA-IICT

Fig. 4.3.3 Site 2 at DA-IICT

Fig. 4.3.4 Site 3 at DA-IICT

It is located behind the boy's hostel where there is shady area and less disturbance. It is protected from sunlight, birds and ants.

There are three sites of Vermicompost The sites are made up of grills so they are easily protected from birds and sunlight.

iii) 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 2.5feet wide and length is as per the vermicompost size. The distance between beds is 2.5.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.

v) 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 are used for vermicompost production [7].

vi) 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].

vii) 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 2 months. The process in the alimentary canal of the earthworm transforms organic waste to natural fertilizer. 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 get compacted when watering is done [7].

Fig. 4.3.5"Castings" final product of vermicompost

The view where the vermicompost is located in DA-IICT

Fig. 4.3.6 Synoptic view of vermicompost site in DA-IICT

[Source: Google map]

Fig. 4.3.7 Zoomed view of vermicompost site in DA-IICT

[Source: Google map]

5. Advantages of Vermicompost at DA-IICT

- 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.
- It prevents nutrient losses and increases the use efficiency of chemical fertilizers.
- 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. Future Improvement

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 can be properly done which is not yet.
4. The students can be encouraged to take active part in the monitoring and working process of the unit and management of the unit.

7. References

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