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Vermi-Technology: (Vermiculture, Methods, Beneficial Effects)

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***Abstract*: Vermicompost which is more or less stable and can be used in improving physical and microbiological condition of soil besides being used as plant nutrients in soil. This study presented the use of vermi-technology, methods and beneficial effects in the organic farming. The composting develop by organic wastes using epigiec earthworms to increase the effeiciency of composting. Using vermiculture is a great way to improve your organic fertilizer. Also known as worm management, vermiculture is an easy process that breaks down organic materials and produces castings that enhance your plants' growth by providing trace elements, enzymes, and nutrients to the soil.**

***Keywords*: Vermi-Technology**

1. Introduction

Modern agriculture has gone through major changes during the last century. It has developed from more or less extensive subsistence farming to highly intensive, often mechanized agricultural production. Modern agriculture depends upon the external application of plant nutrients needed year to harvest quantum of produce required for increase human population. Most cultivated soils in tropical climate are poor in organic matter. Recycling of organic matter in agriculture brings in the much needed organic matter to the soil. Since most recyclable waste are organic and they directly add organic matter and the plant nutrient contained in them and improve soil physical, chemical and biological properties as well as overall soil productivity (Khan et al, 2005). The disposal of ever increasing amounts of urban wastes and agricultural wastes is becoming a serious problem in India. The recycling of crop residues and organic wastes through vermi-composting is the key technology for production of organic manures within a short period. Vermi-compost quality is closely related to its stability and maturity. As many different chemical and biochemical changes occur during vermicomposting, the choices of raw materials and the vermin-composting method have made it difficult to agree on methods for the practical assessment of maturity. Various parameters have been used to assess the quality and maturity of composts. Changes in total organic carbon, total nitrogen, C: N ratio and biochemical properties during vermin-composting dictate the maturity of the compost (Rama lakshmi et al, 2013). Vermi-tecnology is a cost effective management method for organic wastes as cereal straw, solid waste, animal waste, wood material, urban refuse, sewage sludge and crop residues, during composting organic material undergo intensive decomposition under influence of the microorganisms finally yielding brown and soft textured vermicompost which is more or less stable and can be used in improving physical and microbiological condition of soil besides being used as plant nutrients in soil. Vermicomposting helps in ‘‘Low External Input Sustainable Agriculture’’ (LEISA). The ‘‘Fatigue of Green Revolution’’ due to stagnation in yield levels and to a larger quantity of nutrients required to produce the same yield as in the early period, can now be changed or rejuvenated by eco-technologies like vermicomposting. (Mahanta and Borah, 2007).

2. Vermi technology

Vermi-Technology is an important aspect of biotechnology involving the use of earthworms for processing various types of organic waste into valuable resources. It is the latest biotechnology which helps in giving bio-fertilizers in the terms of vermicompost, for agricultural uses and a high quality protein (earthworm biomass) for supplementing the nutritional energy needs of animals, at a faster rate. Vermicompost, specifically earthworm casts, are the final product of vermicomposting. It is an aerobic, bio-oxidation and stabilization of nonhaemophilic process of organic waste decomposition that depends upon earthworms to fragments, mix and promotes microbial activity. Vermicomposting facilities are reported to be already in commercial operation in Japan, Canada, USA and is also being efficiently practiced in Philippines and in Asia.

Vermicompost is rich in microbial diversity, population, and activity and vermicast contains enzymes such as proteases, amylases, lipase, cellulose and chitinase which continue to disintegrate organic matter even after they have been ejected. The chemical analysis of casts shows 2 times the available magnesium, 5 times the available nitrogen, 7 times the available phosphorus and 11 times the available potassium compared to the surrounding soil. The vermicompost is considered as an

excellent product that has reduced the level of contaminants and tends to hold more nutrients over a longer period without impacting the environment.

A. Methods of preparation

1. The vermicompost can be prepared in concrete tank. The size of the tank should be 10 ft. length or more depending upon the availability of land and raw materials, breadth 3-5ft and height 3 ft. Suitable plastic tube / basin structure may also be needed. The floor of the tank should be connected with stones and pieces of bricks.
2. The available bio-wastes are to be collected and are to be heaped under sun about 7-10 days and be chopped if necessary.
3. Sprinkling of cow dung slurry to the heap may be done.
4. A thin layer of half decomposed cow dung (1-2 inches) is to be placed at the bottom.
5. Place the chopped weed biomass and partially decomposed cow dung layer wise (10-20 cm) in the tank / pot upto the depth of 2 ½ ft. The bio waste and cow dung ratio should be 60: 40 on dry wt. Basis.
6. Release about 2-3 kg earthworms per ton of biomass or 100 nos. earthworms per one sq. ft. area.
7. Efficient species:
   - Eisenia foetida
   - Amyanthes diffrigens
   - Eudrillus engineac
8. Place wire net / bamboo net over the tank to protect earthworm from birds.
9. Sprinkling of water should be done to maintain 70-80 % moisture content.
10. Provision of a shed over the compost is essential to prevent entry of rainwater and direct sunshine.
11. Sprinkling of water should be stopped when 90 % bio-wastes are decomposed. Maturity could be judged visually by observing the formation of granular structure of the compost at the surface of the tank.
12. Harvest the vermicompost by scrapping layer wise from the top of the tank and heap under shed. This will help in separation of earthworms from the compost. Sieving may also be done to separate the earthworms and cocoons.

Table 1
Organic wastes for vermicomposting, Sabine, J. R. (1983)

Materials	C:N ratio
Crop residues	48-150:1
Weed biomass	20:1
Vegetable waste	11:1
Leaf litter	30-40:1
Kitchen waste	15:1
Cow dung	25:1
Biodegradable portion of urban and rural wastes	35:1

Vermicomposting has various beneficial effects, such as,

Effects on soil

- It improves the physical structure of soil making soil friable and productive. Its create favourable environment for plants root and help them to develop.
- It increases the organic matter content of soil and insure the continuity of biological activity.
- It adds microorganism to soil.
- It has 10-20 times higher microbial activity than in soil.
- It increases the capacity of soil to supply nutrients and heps in water conservation.
- Humus present in vericompost improves cation exchange capacity of the soil by which the availability of potassium, calcium, magnesium and other trace elements become easier.
- It contains valuable vitamins, enzyme and hormones like auxin, gibberellins etc.

Table 2
Nutritive value of vermicompost

Nutrients	Percent
Organic carbon	9.5 – 17.98%
Nitrogen	0.5 – 1.50%
Phosphorous	0.1 – 0.30%
Potassium	0.15 – 0.56%
Sodium	0.06 – 0.30%
Calcium and Magnesium	22.67 to 47.60 meq/100g
Copper	2 – 9.50 mg kg-1
Iron	2 – 9.30 mg kg-1
Zinc	5.70 – 11.50 mg kg-1
Sulphur	128 – 548 mg kg-1

Effects on plant growth

- It enhances germination, plant-growth and crop yield. It also improves the quality and shelf life of the produce.
- It improves growth of roots and its structure.
- It is rich in all essential plant nutrients on comparison to other organic manures.
- It increases the population of atmospheric nitrogen fixing bacteria.
- Continuous use of Vermicompost minimizes the incidence of pests and diseases if done year by year.

Effect on economy

- Conversion of bio-wastes reduces waste flow to landfills.
- Elimination of bio-wastes from the waste stream reduces contamination of other recyclable collected in a single bin.
- Vermicompost is free flowing, easy to apply, handle and store and does not have bad odour.
- Create low-skill jobs at local level.
- Low capital investment and relatively simple technologies makes vermicomposting practical for less developed agriculture regions.
- Lower expenditure on pollution control.
- It boosts the rural economy.

Effect on environment

- Throw recycling waste on-site, it helps to close the metabolic gap.
- Production reduces greenhouse gas emission such as

methane and nitric oxide.

- Vermicompost is made from refused wastes, cattle dung and crop residues, hence it reduces foulness saves the environment.

3. Conclusion

This paper presents an overview on Vermi technology.

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