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Vermicompost: Best Component of Organic Farming

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SUMMARY

Vermicomposting is a green technology that converts organic wastes into plant available nutrient rich organic fertilizer. It has also found to reduce heavy metal concentration in contaminated feeding materials. Vermicompost (VC), when used as fertilizer, not only bears positive impact on soil quality, plant growth and yield but also enhances nutritional value of crops produced. Use of VC on soil improves its physiochemical (aggregation, stability, pH, EC, bulk density, water holding capacity (WHC), organic matter (OM), micro-and macro-nutrients.) and biological properties (microbial population, enzymes). It also increases soil structural stability and reduces vulnerability of soil to calamities like erosion. Use of VC in plant growth enhances their development in early as well as latter stages of plant growth but proper concentration of VC must be considered for optimum plant growth and production.

INTRODUCTION

The increase in population causes an increase in the quantity and type of urban and rural wastes. Such wastes are undesirable pollutants to the environment and time could even be a health menace. As far as rural wastes are concerned, there production, as well as an assortment of possible uses for the future. Vermicomposting is the process of producing organic fertilizer or the vermicompost from bio-degradable materials with earthworms. Composting with worms avoids the needless disposal of vegetative food wastes and enjoys the benefits of high quality compost. The earthworm is one of nature's pinnacle "soil scientists." Earthworms are liberated and cost effective farm relief. The worms are accountable for a variety of elements including turning common soil into superior quality. They break down organic matter and when they eat, they leave behind castings that are an exceptionally valuable type of fertilizer. The utilization of waste materials through the earthworm has given the concept of vermicomposting. The vermicompost technology approach utilizes waste management process by involving earthworms. Improvement of soil through vermiculture has now become a popular part of organic farming. Vermicmpost is accepted as humus biofertilizer, soil fertility booster, soil activator and soil conditioner with required plant nutrients of storage polysaccharides and structural polysaccharides, vitamins, enzymes, growth regulators and beneficial microorganisms like nitrogen fixing, phosphate solubilizing, denitrifying, decomposing bacteria and methanogenic bacteria. "The Green Revolution" that was promoted in early part of 20th century, was a boost to food production without foreseeing its ill effects. The recent realizations to maintain ecological balance for sustenance of agricultural production, farmers and scientists alike are aiming at finding an alternative to chemical agriculture. India has a long tradition of agriculture with a rich heritage of eco friendly agriculture technologies.

Vermiculture

Vermiculture is the method of mass multiplication of earthworms. It is an excellent tool of organic farming, which is helpful in maintaining soil fertility status for a long time.

Vermicompost

Vermicompost is nothing but the excreta of earthworms, which is rich in humus and nutrients. Vermicompost is a mixture of worm castings, organic material, humus, living earthworms, cocoons and other organisms. Depending upon nature of substrate, vermicompost contains 2.5 – 3.0% N, 1.0 – 1.5% phosphorous and 1.5 – 2.0% potash. In India, only two species are being commonly used for vermiculture namely Eisenia foetida, and Eudrilus eugeniae.

The materials required for vermicomposting are :

- Cattle dung,

- Agricultural wastes, e.g. vegetables wastes, sugarcane trash etc.
- Plant products, e.g. sawdust and pulp, various types of leaf litter.
- City refuse or garbage
- Biogas slurry
- Industrial wastes.

Vermicompost can be prepared by pit, heap method or in concrete tank. However, all the methods shed is necessary for protecting the worms from rain and direct sunlight.

Preparation of Vermicompost by heap Method

1.Prepare the heap of organic matter having size 2.5 – 3 m length, and 90 cm width.
2.First sprinkler the water on ground
3.Place 3-5 cm thick layer of slowly decomposing organic substances such as coconut coir, grass, rice husk, baggas etc. and sprinkle sufficient water on it.
4.Over this layer, place 3-5 cm thick layer of partially decomposed FYM or Compost or Garden soil and moist it. This layer will serve as a temporary shelter for earthworm
5.Then release the earthworm on it.
6.Then place a layer of partially decomposed crop residue, cow dung, weeds, leaves of glyricidia, poultry manure. fish meal etc. For enhancing decomposition and vermicomposting process the organic material should be cut into smaller pieces. The total height of the heap should not be more 60cm. Sprinkle sufficient water on it.
7.Cover the heap with gunny bag and sprinkle water daily to maintain 40-50 % moisture content. The temperature of the heap should be 25 – 300C.
8.After 2 - 2.5 months the heap will be ready for harvest with good quality vermicompost. The removed vermicompost should be heaped in an open place. Then the worms will find way to the bottom of the heap. The vermicompost from the top can be removed, dried in shed and sieved to separate the earthworm, which will be again used for preparation of vermicompost.

Preparation of Vermicompost in concrete Tank

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 bio waste and partially decomposed cow dung layer wise (10-20 cm) in the tank / pot up to 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. Place wire net / bamboo net over the tank to protect earthworm from birds.
8. Sprinkling of water should be done to maintain 70-80 % moisture content.
9. Provision of a shed over the compost is essential to prevent entry of rainwater and direct sunshine.
10. 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.
11. 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.

Advantages of Vermicompost:

1.Vermicompost is rich in all essential plant nutrients.
2.Vermicompost is free flowing, easy to apply, handle and store and does not have bad odour
3.It improves soil structure, texture, aeration, and water holding capacity and prevents soil erosion

4.Vermicompost is rich in beneficial micro flora such as a fixers, P- solubilizers, cellulose decomposing micro-flora etc. in addition to improve soil environment.
5.Vermicompost contains earthworm cocoons and increases the population and activity of earthworm in the soil
6.It prevents nutrient losses
7.Vermicompost is free from pathogens, toxic elements, weed seeds etc.
8.Vermicompost minimizes the incidence of pest and diseases.
9.It enhances the decomposition of organic matter in soil.
10. It contains valuable vitamins, enzymes and hormones like auxins, gibberellins etc.

Vermin-Wash

The preparation of vermiwash is made from earthworms reared in earthen pots or plastic drums. It contains vitamins (B-12), hormones (giberllins) etc.

The Steps Followed in Preparation of Vermin-Wash are as Follows

1.Take plastic drum of 60 lit. capacity having a hole situated at the bottom, to which water tap fixed to collect vermiwash
2.Fill the drum with pieces of bricks upto 10 cm height from the bottom, above which 5 cm thick layer of coarse sand is add, Above this, a plastic net is placed and spread out for effective drainge.
3.Place 30 cm thick layer of partially decomposed 15-20 days old cow dung and sprinkle sufficient water to moisten the layer.
4.Release 500 full grown earthworms in the waste/dung layer.
5.Place 30 cm thick layer of organic material and sprinkle water @ of 50 % of the weight of organic matter to moisten the layer. The water should be sprinkled at two days interval.
6.Allow the composting process to continue till brownish black mask of compost is obtained. Occasionally, two or three tablespoons of fresh cow dung slurry is poured on the humus as feed for the worms.
7.After the formation of compost, soak the entire mask with water. After 24 hours the stagnated water at bottom of drum is collected through water tap fixed at the bottom is called as 'Vermiwash'.

CONCLUSION

Vermi composting can be used as an organic fertilizer alternative to in organics as it improves soil quality as well as plant growth and production. It can also be used for bioremediation of HV contaminated soil. It is thus found to improve soil physio-chemical and biological properties. It is suggests that VC should be used at appropriate rate depending on type of crops grown and its nutrient requirement for cost effectiveness. Overall, VC is boon to organic farming.

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