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Vermiculture

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Introduction:

Vermiculture is formed from the 'Latin term' 'Vermis' which means 'worms' and 'Cultura' which means 'growth'. Vermiculture is the scientific method of cultivating worms and artificially raising them for human use. Vermiculture is a field of biotechnology that includes the growing of earthworms. Earthworms have long been viewed as farmers' allies, as their presence in the soil promotes both soil fertility and crop yield. Earthworms are effective bioconversion agents for organic waste. Earthworms promote sustainable agriculture and assist to reduce pollution by recycling waste.

Earthworms:

Earthworms are segmented, boneless, bisexual creatures. They do not have a head, ears, teeth, or nose, yet they are sensitive to touch and light. They take in oxygen through their skin. The mouth is at one end of the body, while the anus is at the other end. Earthworms reproduce quite quickly, producing 200-250 worms per year. They like shade, wet conditions, and soil pH levels ranging from 6.5 to 7.5 for growth. Earthworms devour decomposed solid wastes of plant and animal origin and transform them into important bio-fertilizers via droppings/casts.

Types of Earthworms:

Earthworms may be classified into two groups based on their dietary patterns.

1. DetrivorusSaprophages:

This sort of earthworm feeds on dead plant roots or other plant or cow manure from animals.

These earthworms live on or near the soil's surface.

Examples include Eisenia foetida, Perinyxexcavatus, and Eudritusengineae.

2. Geophages saprophages :

These earthworms consume soil that has been enriched with organic stuff. They consume the food that is found in the soil's deeper layers. For instance: Octochaetona thurstoni,

Vermicompost:

- Vermis, which meaning "worms" in Latin, is where the word "vermicompost" comes from.Using earthworms to create enriched compost is known as vermicomposting. It is among the simplest ways to turn agricultural waste into high-quality compost.
- Earthworms eat biomass and release it as worm eggs, which are digested waste products. A common term for worm casts is "Black gold." Rich in nutrients, growth-promoting compounds, and good soil or flora, the casts also have the ability to suppress pathogenic bacteria and enhance PGPR.

Material for Vermicomposition:

- Decomposable organic wastes such as animal excreta, kitchen waste, farm residues and forest litter are commonly used as composting materials.
- In general, the main basic materials are dried agricultural wastes and animal manure, mostly cow dung.
- The quality of vermicompost is improved by combining leguminous and non-leguminous agricultural leftovers.

Species of Earthworms:

In India, there are over 350 different species of earthworms with different eating and borrowing tendencies. Vermicomposting uses worms such as Eisenia foetidia, Eduritusengineae, Perinyxexcaratvus, and Polypheretima elongata. It can be carried out in well rings, plastic crates, concrete tanks, pits, and wooden crates.

Eisenia foetida (Redearthworm) :

Due to their ability to adapt to the warm, humid circumstances that are perfect for vermicomposting, Eisenia foetida, also known as red wigglers and red earthworms, are generally regarded as the finest species of earthworms for vermicomposting. With a rapid rate of

reproduction, these earthworms turn organic materials into compost in 45–50 days. As surface feeders, these earthworms turn organic matter into vermicompost from above.

Vermicompost in Pit:

For ease of management, the pit should be 2 m x 1 m x 0.75 m in size. For the earthworms, a vermibed must be made at the bottom of the hole. This is accomplished by covering a thin layer (about 5 cm) of sand and broken bricks with a layer of excellent loamy soil that is 15 to 20 cm deep. The soil layer that earthworms will live in is where they are introduced. For the pit's size, an ideal inoculating density would be around 100 earthworms. It is necessary to keep the vermibed damp without flooding it.

Fresh animal manure is then scattered around the vermi-bed in little lumps. After that, dried leaves or hay are stacked on top of the compost pit until it is about 5 cm deep. To keep worms safe from birds, the pit might be covered with coconut or palmyrah leaves.

Wet organic wastes from plants and/or animals are dispersed over the partially decomposed organic layer to a thickness of around 5 cm after 30 days of decomposition. You must do this twice per week. Without disturbing the "vermibed in which the worms live," organic wastes can be regularly flipped over or mired using a hand tool. You can keep adding organic garbage until the pit is almost filled. For a further 30 to 45 days, the pit must be maintained wet.The material in the pit must be periodically flipped over during this time to avoid upsetting the vermibed. Maintaining the pit's moisture content requires watering it every other day. This will shield the earthworms from predators such as birds, rodents, mice, snakes, centipedes, cockroaches, and anis. It is necessary to stop watering the compost for three to four days during manuration in order to reduce its moisture level. Worms migrate to the deeper layer as a result, finally becoming vermibed. It is possible to dig up the mature compost without uprooting the vermibed area. Within four months, vermicompost will be prepared for field use.

Phases of Vermicomposting:

Phase1. Processing includes garbage collecting, shredding, mechanically separating glass, ceramics, and metal, as well as storing biological waste.

Phase2. Organic waste is pre-digested for 20 days by stacking it with slurry made from animal manure. The substance is partially digested during this procedure, making it suitable for earthworm eating. After drying, biogas slurry and cattle manure can be utilized. Vermicomposting shouldn't be done with wet dung.

Phase3. Earthworm bed preparation. To prepare the trash for vermicompost, a concrete basis is needed. In addition to allowing worms to enter the soil, loose soil also allows water and all of the soluble nutrients to enter the soil.

Phase4. Earthworm collecting follows vermicompost gathering. To separate the fully composted material from the composted stuff, sieve it. The material that has partially decomposed will be re-incorporated into the vermicompost bed.

Phase5. Vermicompost should be stored properly to preserve moisture and promote the growth of the helpful microorganisms.

Steps followed for vermicompost preparation:

- A cold, damp, and shaded location is ideal for a vermicomposting unit.
- Chopped dry leafy materials and cow manure are combined in a 3:1 ratio and allowed to partially decompose for 15 to 20 days.
- As bedding material, place a layer of chopped dry leaves or grasses at the bottom of the bed, about 15 to 20 cm deep.
- 6x2x2 foot beds comprised of partially decomposed material should be constructed.
- The number of beds can be increased based on the availability and needs of raw materials, but each bed should hold 1.5–2.0q of raw material.
- On the top layer of the bed, red earthworms (1500–2000) should be released.
- As soon as the worms are released, water should be sprayed with a can.

- Beds should be covered with gunny bags or polythene and sprayed with water every day to keep them wet.
- For optimum decomposition and to preserve aeration, the bed should be changed once every 30 days.
- It takes 45 to 50 days for compost to be ready.
- One-eighth of the raw components are used in the final product.

Harvesting:

- When the raw material is fully broken down, it looks grainy and black.
- As compost prepares, watering should cease.
- To allow earthworms to go from compost to cow dung, the compost should be placed on top of a pile of partially decomposed cow dung.
- Compost may be sorted and sieved for use after two days.

Advantages of Vermicompost:

1. All of the vital plant nutrients are abundant in vermicompost.
2. Has a great impact on the general growth of the plant, promotes the development of new shoots and leaves, and enhances the produce's quality and shelf life.
3. Vermicomposting is odorless, free-flowing, and simple to handle, store, and apply.
4. It stops soil erosion and enhances the structure, texture, aeration, and water-holding capacity of the soil.
5. In addition to improving the soil environment, vermicompost is rich in helpful microflora, including fixers, P-solubilizers, and cellulose-decomposing microflora, among others.
6. Earthworm cocoons are found in vermicompost, which boosts the earthworm population and activity in the soil.
7. It negates the protection of the land.
8. It improves the effectiveness of artificial fertilizers and stops nutrient losses.
9. Vermicompost is devoid of harmful substances, weed seeds, and other contaminants.
10. Vermicompost reduces the prevalence of illnesses and pests.

11. It promotes the organic matter's breakdown in the soil.

12. It has important vitamins, enzymes, and hormones like gibberellins and auxins.

Conclusion:

Vermicompost has been demonstrated to improve soil, plant development, and overall health in a number of ways. Furthermore, it is regarded as a viable substitute for hazardous chemical pesticides and fertilizers in crop cultivation. In order to create healthier meals and provide a better choice for managing organic solid waste, it is increasingly being used as a key component of organic agriculture. The use of vermicompost in organic farming systems has a bright future thanks to research on earthworm-microbe interactions, dose-specific use of vermicompost, integrated use of vermicompost with other inorganic fertilizers, utilization of various high-nutrient organic substances, and the exploration of potential earthworm species in vermiculture technology along with soil-friendly microbes.