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Vermicompost: Organic Wonder to achieve Agricultural Sustainability

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Vermicomposting, as the name suggests, is a method of producing compost using earthworms that consume soil biomass and excrete it in a digested form. Compost prepared in this way is called vermicompost. This organic wonder has attracted many studies and researchers over the years. Many of the recent uses of vermicompost are the result of such studies. Traditional uses of vermicompost include the use of vermicompost in agriculture and horticulture.

The earthworm gut contains humic acids that help convert soil biomass into nutrient-rich building blocks. They can increase soil porosity, which further increases soil fertility. These desirable properties of earthworms are ingeniously used in the production of vermicompost.

Table 1: Nutrient composition of vermicompost:

S.No.	Nutrients	Content (%)
1.	Organic carbon (OC)	9-18
2.	Total Nitrogen (N)	1.5-2.25
3.	Total Phosphorus (P)	1.0-1.5
4.	Total Potassium (K)	0.60-1.0
5.	Calcium and Magnesium (Ca and Mg)	20.00-70.00 m.e/100g
6.	Sulphur (S)	120-550 ppm
7.	Copper (Cu)	100 ppm
8.	Iron (Fe)	1800 ppm
9.	Zinc (Zn)	50 ppm

*The content can vary as per the material used and climatic conditions also

Vermicompost contains significant amounts of the most important triad in plant nutrition; NPK. In addition, they contain significant amounts of other important micro- and macronutrients. The nutrient composition of vermicompost is shown in the table 1

In addition to these nutrients, they contain the following enzymes

a) Protease b) Lipase c) Amylase d) Cellulose

The presence of these essential plant nutrients is the primary reason for the use of vermicompost in agriculture,

Advantages of vermicompost

- Vermicompost is an all-in-one package for agriculture: Its chemical and physical properties provide benefits such as increased soil fertility, direct and indirect resistance to pests and diseases, and increased plant yield and productivity, as already discussed in the use of vermicompost in the agricultural section.

- Biodegradation of agricultural residues: Vermicompost has enzymes such as protease, lipase, amylase, cellulase and chitinase whose functions include biodegradation of agricultural residues in the soil. It also catalyzes further microbial attack on the residue and speeds up the process.
- It is cheap and cost-effective: For a natural fertilizer that is primarily made from organic waste and has a lot of benefits, vermicompost is cheaper compared to other fertilizers commonly used in agriculture, making it a perfect cost-effective organic fertilizer.
- Perfect for use in vegetable and ornamental gardens: Although they improve the overall health of plants and increase their productivity, unlike other natural manures and decomposing organic waste, they do not emit any unpleasant odors, making them suitable for use in the garden.
- Easy to prepare and use: Making vermicompost is a simple process and requires no technical knowledge. Even a farmer can do it himself with a little practice.
- Business Prospects: Vermicomposting can be undertaken as a business venture as it has a high potential for success. The initial investment is low and can be done by farmers who are also not making much income. Minimal work is enough. As more and more emphasis is placed on organic farming, especially in individual households, an increase in demand is expected, which can be exploited if the business is done skillfully.
- Promoting sustainability: The use of vermicompost can reduce the extensive use of chemical fertilizers and pesticides to some extent. This leads to the improvement of soil properties and the rejuvenation of the soil ecosystem.

How to prepare vermicompost?

The simplest and most effective method used is the pit or heap method. This means that the compost is prepared in a pit or pile.

Materials needed for vermicomposting

a) Basic raw material: any organic material created on the farm, such as cow dung, leaf litter, husks from paddy fish, etc. These are used as feed material for earthworms.
b) Starting material: cow dung, biogas slurry or cattle urine. This starts the feeding process
c) Thatched roof or vermish: to cover the compost.
d) Soil animal: earthworms. Different types of earthworms are used in vermicomposting.

Types of earthworms used in vermicomposting

When someone asks you to name the organism used in making vermicompost, you should undoubtedly answer as earthworms. Earthworms belong to the phylum Annelida of the animal kingdom. They are characterized by long and cylindrical grooves containing the body. Although it is a hermaphrodite, it takes two adult worms to reproduce. Their average lifespan varies by species and ranges from 1 to 10 years.

There are more than 3000 species of earthworms in the world. Based on their soil niche, earthworms can generally be divided into epigeic (surface dwellers) and epianecic (subsoil dwellers). In detail, the classification looks like this:

Epigeic worms are widely used in vermicomposting. Among them, the best species for vermicomposting are considered red vetch *(Eisenia fetida*). Another species of earthworm that is also used for vermicomposting is the African Nightcrawler (*Eudrilus eugeniae*).

Favourable conditions for vermicomposting

pH range: 6.5 to 7.5
Humidity: 60 to 70%
Aeration: 50% aeration from the total pore space
Temperature: 18 °C to 35°C

Mechanism of vermicompost preparation

Step 1: Prepare the pit or pile: They are prepared either by the pit method or the heap method. The dimensions of the pit are 10 x 4 x 2 feet. The length or width can be increased, but not the depth, as earthworm activities are limited to a depth of 2 feet only.

Step 2: Choose a suitable location: The chosen place should be shady and free of stagnant water. The location should be near a water source.

Step 3: Preparing the bed: Compost should be prepared in layers, with each layer having different types of materials.

First layer: 1″ thick bedding material with soft sheets.

Second Layer: A 9″ thick organic residue layer consisting of finely crushed material.

Third layer: The same mixture of cow dung and water about 2″ thick.

Step 4: Maintain proper humidity: Maintain proper moisture in the pit by turning and watering constantly.

Step 5: Introducing the Worms: On the 24th day, 4000 worms should be introduced into the compost pit. The compost should then be regularly turned and watered. Within days, the materials would turn into compost.

Step 6: Harvesting Vermicompost: Watering should be stopped 1 week before harvest. Initially, the top layers of the compost should be disturbed by hand. This forces the earthworms to penetrate the deeper layers, ridding the top layer of worms. The materials from the upper layers are collected and the process is repeated. The collected products are then sieved using a 2 mm sieve and then transferred to polybags. This collected material is called vermicompost and is stored for later use. This is how vermicompost is prepared. The final product of vermicomposting is used as worm castings or worm tea. The final product of vermicomposting is also used as a starter for the next batch of compost.

Conclusion

Through this discussion, we focused mainly on the use of vermicompost, the use and benefits of vermicomposting in agriculture, the use of vermicompost in organic farming, the use of vermicompost in garden areas, in vegetables and also the use of vermicompost in pollution control and soil regeneration. We have also seen its benefits and its preparation.

Vermicompost has truly lived up to its name, Garden Gold. But it doesn't stop there, vermicompost also has soil regeneration and pollution control capabilities that can unlock the keys to sustainable agriculture and revive the tiny hopes in our minds for a greener and better future. It is truly amazing how such tiny organisms can turn something useless into such useful products that can fill the entire food chain by acting on their basic counterpart. Therefore, the use of vermicompost should be popularized along with the promotion of responsible and sustainable agriculture.