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# Biotech-Vermiculture a Sustainable Agriculture

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## INTRODUCTION

Modern agriculture based on chemicals is not sustainable because of many problems such as loss of soil productivity from excessive erosion and associated plant nutrient losses, surface and ground water pollution from pesticides, fertilizers and sediment, impending shortages of non-renewable resources, and low farm income from high production costs. As a result, there is increasing awareness of the need for alternative agricultural systems. Such a system should integrate traditional practices with modern understanding of life science. The concept of soil, as a living system, is central to alternative farming systems as opposed to chemical farming.

### Vermiculture Biotechnology

Biotechnology essential involves a large-scale application of bio-systems for economic and effective processing of materials to produce value added. Vermiculture is culturing of earthworms. Vermiculture biotechnology is, therefore, an aspect of biotechnology involving the use of earthworms as versatile natural bioreactors for effective recycling of non-toxic organic wastes to the soil, resulting in soil improvement and sustainable agriculture. Earthworms are invertebrates assigned to phylum *Annelida*, class *Chaetopoda* and order *Oligochaeta*. *Oligochaeta* includes the major earthworms belonging to *Megascolecidae*, *Lumbricidae* and other families. More than half the earthworm species of the world belong to *Megascolecidae*. The genus *Phretinia* alone has a large number of species. Both *Megascolecidae* and *Lumbricidae* are valuable to agriculture and are, therefore, intimately linked to human welfare, development and progress.

The commonly used species are:

1. *Eiseniafretida*, *Perionyx excavates*, *Lumbrieusrubellus*, *L. terrestris*, *Eudrillus* spp.
2. *Lampitomauritii*, *Octochaetona serrate*, *DrawidaWillsi*, *O. surensis* and *O. thurstoni*.
3. Earthworm's gut is an effective tubular bioreactor with raw materials (feed) entering from one end and the product (castings) coming out through the other end.
4. They maintain a stable temperature through novel temperature regulation mechanisms, thus accelerating the rates of bioprocesses and preventing enzyme inactivation caused by high temperatures.

**Procedure to Prepare Vermicompost**

**Culturing technique:** A large number of wooden, plastic, card board or cement boxes of various sizes can be used. This volume can accommodate 1500 worms. Culturing is done indoors avoiding sunlight and rain.

**Culture bed:** At the bottom of the box, a layer of bedding material is spread to a thickness of 2.5 to 5.0 cm. this can be any biodegradable material. On this, a second layer of about 5 cm thick partially digested cow dung is spread. Water is sprinkled on the bed to get a moisture level of 30-40 per cent. Worms or their cocoons are then introduced on the bed.

**Feed composition:** Dried dung of cattle, sheep, horse, pigs or droppings of poultry and small shredded pieces of vegetable waste form the ideal food for the worms. Cattle dung can be fed as such if available, but other dung materials or vegetable wastes can be mixed in equal quantity with cattle dung for feed acceptability. Wheat bran, grain bran and vegetable waste, when added to dung in 10 : 11.1 ratio, will enhance the quality of the compost and biomass production.

**Feed application:**

The feed is to be placed uniformly in a layer on the culture bed and replenished as when it disappears from surface.

**Worm cast production and collection:** When compost is ready, watering is stopped for 2-3 days, when all the worms retire to the bed below where some water still exists. The compost is then dry and can be piled in small heaps in ambient conditions for a couple of hours when all the worms will godown the heap to the bed. The heaps then become compost heaps containing worm cocoons. Fresh feed material should be placed immediately the worms and should be discarded after 6 months and a fresh bed should be laid as done earlier.

**Application of Vermicompost**

In orchards the dose depends on the age of the tree. A deep ring of 15-20 cm is to be formed around the tree. A thin layer of dry cow dung and bone meal with 2-5 kg of vermicompost is then applied. This is covered with a thin layer of soil. This ring is mulched with organic matter and a light spray of water is given. In plots, a handful of vermicompost should be applied near the rootzone. The application should be repeated after one month and water should be added to keep it moist. For general use in agriculture, vermicompost should be applied at 5 t/ha. Vermicompost is mixed with equal quantity of dried cow dung. This is broadcasting when seedlings are 12-15 cm high and water should be sprinkled.

**Benefits of Vermiculture Biotechnology**

Vermiculture biotechnology can be fruitfully utilized to gain several benefits:

1. Less reliance on purchased inputs leading to low cost of production.
2. Enhancement of soil productivity.
3. The produce with better taste, lustre and keeping qualities without toxic residues can be produced, fetching a higher price.
4. Recycling of organic eastes is achieved.
5. There is a cost-effective pollution abatement technology

6. Wastes create no pollution, as they become valuable raw materials for the soil biotechnology processes

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