

## Vermicompost: A Bank of Micronutrients for Sustainable Agriculture

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Organic fertilizers are alternative to chemicals used in agriculture which enhance soil quality, prevent harmful chemicals entering into food chain, improve health and contribute to sustainable future socially, economically and ecologically. *Vermicompost* is a nutrient-rich organic fertilizer which promotes plant growth and improves soil quality. The weed biomass generated after various management methods are considered as organic waste. Vermicomposting is a process of scientifically decomposing agricultural, municipality, and industrial wastes into nutrient enriched compost by earthworms. Vermicompost not only balance underground soil environment and makes is a suitable habitat for soil micro biota but also improves above ground environment. Microbes are the fundamental element of ecosystem. Use of vermicompost increases growth and proliferation of microbes that amplify environment's betterment. Vermicomposting is also affordable for resource poor small and marginal farmers. Therefore, vermicompost use is more economical than synthetic organic fertilizer. So, economic viability, environmental stability, and enhancing livelihood quality are the major causes for its worldwide adoption in food production.

### Vermicompost: Black Gold

Vermicomposting is an extension of composting technology in which earthworms are involved in the degradation process. Earthworms consume organic matter and accelerate degradation process. Vermicomposting is one of the many potential approaches that have gained significant attention over decades. It is an eco-friendly concept of waste management where decomposition process is aided by microorganisms. Earthworms are the biological engineers since the beginning of humankind. The technique of culturing earthworm for managing wastes and preparing compost is known as vermicomposting.

Vermicomposting is defined as a bio-oxidative process where earthworms and decomposer microorganisms (bacteria, fungi, and actinomycetes) act synergistically to manage organic waste in a scientific way that also aids in improvement of soil physical, chemical, and biological properties.

Vermicompost not only supplies plant nutrients and growth promoting hormones but also improves soil physical property through soil aggregation. Hence it is used as a component of organic farming. Vermicompost has also been proven to be a miraculous plant growth stimulator.



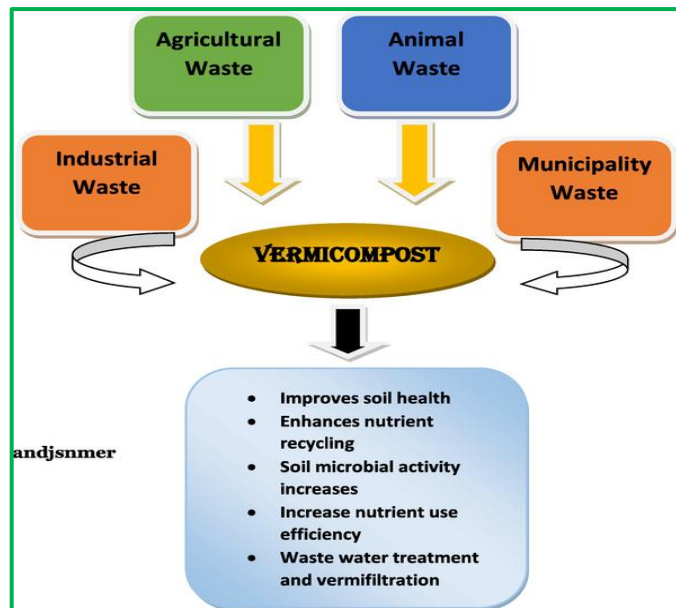


Vermi-cast, the end product is also rich in hormones and enzymes which make the soil environment favourable for soil biota.

### Terrestrial weed and kitchen biomass as an organic waste for vermicompost

In the recent time various researches revealed the utilization of terrestrial weed and found significant results while producing vermicompost. Among the most noxious terrestrial weed species mostly investigated for the potential of vermicompost production are *Lantana camara*, *Parthenium hysterophorus* etc. The

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### Methods of Vermicomposting

Vermicomposting is done by various methods, among them bed and pit methods are more common.



1) Bed method: Composting is done on the pucca / kuccha floor by making bed (6x2x2 feet size) of organic mixture. This method is easy to maintain and to practice.

2) Pit method: Composting is done in the cemented pits of size 5x5x3 feet. The unit is covered with thatch grass or any other locally available materials. This method is not preferred due to poor aeration, water logging at bottom and more cost of production.



### Process of Vermicomposting

- Vermicomposting unit should be in a cool, moist and shady site. Cow dung and chopped dried leafy materials are mixed in the proportion of 3:1 and are kept for partial decomposition for 15 – 20 days.
- A layer of 15-20cm of chopped dried leaves/grasses should be kept as bedding material at the bottom of the bed.
- Beds of partially decomposed material of size 6x2x2 feet should be made. Each bed should contain 1.5-2.0q of raw material. Red earthworm (1500-2000) should be released on the upper layer of bed.
- Water should be sprinkled with can immediately after the release of worms. Beds should be kept moist by sprinkling of water (daily) and by covering with gunny bags.
- Bed should be turned once after 30 days for maintaining aeration and for proper decomposition. Compost gets ready in 45-50 days. The finished product is 3/4th of the raw materials used.



### Harvesting

- When raw material is completely decomposed it appears black and granular. Watering should be stopped as compost gets ready.
- The compost should be kept over a heap of partially decomposed cow dung so that earthworms could migrate to cow dung from compost. After two days compost can be separated and sieved for use.



### Nutrient content of vermicompost

Nutrient Composition	Content
Organic Carbon	9.15 to 17.98 %
Total Nitrogen	1.5 to 2.10 %
Total Phosphorus	1.0 to 1.50 %
Total Potassium	0.60 %
Calcium(Ca) and Magnesium(Mg)	22.00 to 70.00 m.e / 100 g
Available Sulphur	128 to 548 ppm
Copper	100 ppm
Iron	1800 ppm
Zinc	50ppm



### Beneficial effects of Vermicompost

**Effect of vermicompost on the soil physiochemical properties:** Addition of vermicompost improves soil physiochemical properties viz. soil structure, soil water holding capacity, penetration resistance, bulk density, soil organic carbon, aggregation, nutrient content, etc. According to the findings of various long term research addition of vermicompost reduces the bulk density of the soil and increases the water holding capacity of soil.

**Effect of vermicompost on the soil biological properties:** Soil biological characteristics viz. soil organic carbon as well as soil microbial biomass, enzymatic activity, population of different beneficial microorganisms, hormones, etc. significantly enhanced with application of vermicompost.



**Effect of vermicompost on plant growth and development:** Vermicompost promotes the growth and development of a variety of plant species, especially various horticulture crops, that is, sweet corn, tomato, strawberry, cereals crop rice, wheat, sorghum, fruit crops papaya and pineapple. Several growth and yield metrics viz. stem diameter, plant height, marketable yield per plant, mean leaf number, and total plant biomass of tomato plant were recorded significantly higher with the application of vermicompost.

**Effect of vermicompost on plant diseases:** Vermicompost applications suppressed the tomato late blight caused by *Phytophthora brassicae*, *Phytophthora nicotianae*, and tomato Fusarium wilt produced by *Fusarium lycopersici*, collar rot of chickpea caused by *Sclerotium rolfsii*

## Conclusion

Vermicompost is considered as a high nutrient biofertilizer with diverse microbial communities, it plays a major role in improving growth and yield of different field crops, vegetables, flower and fruit crops. Vermiwash is rich in enzymes, plant growth hormones, vitamins along with micro and macronutrients which in-creases the resistance power of crops against various diseases and enhances the growth and productivity of crops. The concept of vermiculture of organic material prove very beneficial to soil because it also removes excessive amounts of heavy metals such as copper and lead and there by served as a means of detoxification. The ultimate aim of sustainable agriculture is to develop more productive, profitable and eco-friendly farming systems.

