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Vermicompost

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Abstract

Vermicomposting is the process of turning organic debris into worm castings. The worm castings are very important to the fertility of the soil. The castings contain high amounts of nitrogen, potassium, phosphorus, calcium, and magnesium. Castings contain: 5 times the available nitrogen, 7 times the available potash, and 1½ times more calcium than found in good topsoil. Earthworms live in the soil and feed on decaying organic material. After digestion, the undigested material moves through the alimentary canal of the earthworm, a thin layer of oil is deposited on the castings. Several researchers have demonstrated that earthworm castings have excellent aeration, porosity, structure, drainage, and moisture-holding capacity. The content of the earthworm castings, along with the natural tillage by the worms burrowing action, enhances the permeability of water in the soil.

Introduction

The vermicompost is the product of the composting process using various species of worms, usually red wigglers, white worms and other earthworms, to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast. Vermicast is the end-product of the breakdown of organic matter by an earthworm. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than the organic materials before vermicomposting. Vermicompost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in farming and small scale sustainable, organic farming. Vermicomposting can also be applied for treatment of sewage sludge. Furthermore, a variation of the process is vermifiltration which is used to remove organic matter, pathogens and oxygen demand from wastewater or directly from black water of flush toilets.

Suitable Worm Species

One of the species most often used for composting is the red wiggler or tiger worm (*Eisenia fetida* or *Eisenia andrei*). Red earthworm or dilong (China) is another breed of worm that can be used, but it does not adapt as well to the shallow compost bin as does *Eisenia fetida*. European night crawlers (*Eisenia hortensis*) may also be used. Users refer to European night crawlers by a variety of other names, including dendrobaenas, dendras, and Belgian night crawlers. African Night crawlers (*Eudrilus eugeniae*) are another set of popular composters. *Lumbricus terrestris* a.k.a. Canadian night crawlers (US) or common earthworm (UK) are not recommended, as they burrow deeper than most compost bins can accommodate.



Figure 1: *Eisenia fetida*

Blueworms (*Periony xexcavatus*) May be Used in the Tropics

These species commonly are found in organic-rich soils throughout Europe and North America and live in rotting vegetation, compost, and manure piles. They may be an invasive species in some areas. As they are shallow-dwelling and feed on decomposing plant matter in the soil, they adapt easily to living on food or plant waste in the confines of a worm bin. Composting worms are available to order online, from nursery mail-order suppliers or angling shops where they are sold as bait. They can also be collected from compost and manure piles. These species are not the same worms that are found in ordinary soil or on pavement when the soil is flooded by water.



Figure 2: *Periony xexcavatu*

Climate and Temperature

There may be differences in vermicomposting methods depending on the climate. It is necessary to monitor the temperatures of large-scale bin systems (which can have high heat-retentive properties), as the feed stocks used can compost, heating up the worm bins as they decay and

killing the worms.

The most common worms used in composting systems, red worms (*Eisenia foetida*, *Eisenia andrei*, and *Lumbricus rubellus*) feed most rapidly at temperatures of 15–25 °C (59–77 °F). They can survive at 10 °C (50 °F). Temperatures above 30°C (86 °F) may harm them. This temperature range means that indoor vermicomposting with redworms is possible in all but tropical climates. Other worms like *Periony xexcavatus* are suitable for warmer climates. If a worm bin is kept outside, it should be placed in a sheltered position away from direct sunlight and insulated against frost in winter.

Small-Scale or Home Systems

- All fruits and vegetables (excluding citrus and other “high acid” foods)
- Vegetable and fruit peels and ends
- Coffee grounds and filters
- Tea bags (even those with high tannin levels)
- Grains such as bread, cracker and cereal (including moldy and stale)
- Eggshells (rinsed off)
- Leaves and grass clippings (not sprayed with pesticides)
- Newspapers (most inks used in newspapers are not toxic)
- Paper towelling (which has not been used with cleaners or chemicals)

Large-Scale or Commercial

- Dairy cow or pig manure
- Sewage sludge
- Brewery waste
- Cotton mill waste
- Agricultural waste
- Food processing and grocery waste
- Cafeteria waste
- Grass clippings and wood chips

Harvesting

Vermicompost is ready for harvest when it contains few-to-no scraps of uneaten food or bedding. There are several methods of harvesting from small-scale systems: “dump and hand sort”, “let the worms do the sorting”, “alternate containers” and “divide and dump.” These differ on the amount of time and labour involved and whether the vermicomposter wants to save as many worms as possible from being trapped in the harvested compost.

The pyramid method of harvesting worm compost is commonly used in small-scale vermiculture, and is considered the simplest method for single layer bins. In this process, compost is separated into large clumps, which is placed back into composting for further breakdown, and lighter compost, with which the rest of the process continues. This lighter mix is placed into small piles on a tarp under the sunlight. The worms instinctively burrow to the bottom of the pile. After a few minutes, the top of the pyramid is removed repeatedly, until the worms are again visible. This repeats until the mound

is composed mostly of worms.

While harvesting, it's also a good idea to try to pick out as many eggs cocoons as possible and return them to the bin. Eggs are small, lemon-shaped yellowish objects that can usually be seen pretty easily with the naked eye and picked out.

Conclusion

The potential feedstock for vermicompost production are livestock wastes, poultry litter, dairy wastes, food processing wastes, organic fraction of MSW, bagasse, digestate from biogas plants etc. Earthworms consume organic wastes and reduce the volume by

40–60 percent. The vermicompost may be sold in bulk or bagged with a variety of compost and soil blends. Markets include home improvement centres, nurseries, landscape contractors, greenhouses, garden supply stores, grocery chains, flower shops, discount houses, and the general public.

Reference

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