

# **Vermicomposting**

By James Glassford – February, 2020

**Vermicomposting** is the process of using worms' good bacteria and other organisms to decompose organic food waste, turning the waste into a nutrient-rich material capable of supplying necessary nutrients to help sustain plant growth. This method is simple, effective, convenient, and noiseless. It saves water, energy, landfills, and helps rebuild the soil. We deplete the soil and deprive nature from rehabilitating itself when we bypass this natural life cycle recycling process. Like regular composting, vermiculture composting is nature's way of completing the recycling loop.

**Advantages of vermicomposting include enriching soil, increasing harvest yields and suppressing plant disease.**

- Vermicompost: After earthworms digest organic matter, they excrete a nutrient-rich waste product called castings...
- Enriching Soil...
- Increasing Plant Growth and Yields...
- Suppressing Disease.

**Vermicomposting** has many benefits for the participants, their communities, and the environment. As a society, we violate nature's ability to complete the life cycle process when we send food down the garbage disposal, or bury it in a landfill. Organic waste (such as kitchen vegetable scraps and garden clippings) make up 30% of household garbage going to landfills.

It reduces greenhouse gas emissions - Organics buried in a dump site break down very slowly and without the presence of oxygen. As a result, methane gas (a greenhouse gas) is produced. It reduces pollution – When organics break down without the presence of oxygen, such as in a dump site, a toxic liquid known as leachate (the liquid that runs from a dump) is produced. Leachate can pollute our soil and water sources.

It reduces the need for chemical fertilizers and pesticides – Finished vermicompost is natural fertilizer that returns valuable nutrients back into the soil, promoting the growth of healthy plants. Vermicomposting improves soil structure, texture, and aeration as well as increasing its water-holding capacity.

Vermicomposting adds beneficial organisms to the soil. These microorganisms and soil fauna help break down organic materials and convert nutrients into a more available food form for plants.

Like composting, vermiculture composting is nature's way of completing the recycling loop. Being born, living, dying, and being reborn again. Adding compost to soil aids in erosion control, promotes soil fertility, and stimulates healthy root development in plants.



*(blue arrow + tray, Pink arrow = spigot for drainage)*

### **Bin Management**

A wide variety of commercial worm bins are available for composting, from simple, ventilated boxes or pails to various “stacked” versions (as above). Most are suitable for basements, entry ways, and other out-of-the-way corners in the home. They can also be used outdoors, at least seasonally, if protected from extremes of heat and cold. Bins with layered trays make harvesting finished compost very easy; this is the primary advantage they offer over most home-made bins and one-room bins.

Place several moist sections of paper (soaked in water) directly on top of food in the feeding tray

### **What to Feed Worms?**

Red wiggler worms will eat about half their weight in food waste per day. One kg. of worms will consume 500 grams of waste per day. Pull aside some of the bedding, putting in food scraps And recover with bedding material or damp newspaper.

1. Food scraps from the kitchen like fruit and vegetable trimmings, lettuce leaves, carrot tops, ground egg shells, orange peelings, banana peelings including table and preparation scraps and vegetables that are past their prime. Starches: pancakes, pizza crusts, cereal, crackers, stale bread that does not contain preservatives, fibre (newspapers that are non-coloured, egg cartons, peanut shells, magazines, Kleenex, napkins, cardboard, junk mail, coconut coir). Do not use peat moss as a source of fibre (too acidic). Coffee grounds and filters, crushed egg shells, dead flowers, plants, trimmings and leaves (non-diseased).

2. It should be 50% kitchen scraps and 50% fibre. Worms like their feeding chopped up (I use a second hand food blender to do this). This makes it easier for the worms to break down and speeds up the composting process.
3. Anything but citrus, meat and dairy products. Citrus fruits are too acidic and salt can burn the worms. Oily foods promote unwanted bacterial growth and odours. Think of the worms as citrus free vegans on a low salt, low fat diet!
4. Moisture - worms require moist bedding - they breathe through pores in their skin and need a moist environment to do so. The moisture should be about the same as garden soil. As a rule of thumb, the compost should feel like a well-wrung sponge: wet to the touch but not dripping. If too much moisture is added the worms will not be able to breathe and bacteria will become overly abundant resulting in worm death and smelly compost
5. Temperature -  
Operating temperature should be between 5 and 27 degrees centigrade and the bin should be in a dry, cool location out of the sunlight. Worms are most active near the high end of the temperature range and will die under freezing conditions.

### **Where Do You Keep Worms? - Bin Management**

Worms can be kept in a single closed container with ventilated lid, or in a layered (stacked) setup with trays that are screened on the bottom to allow upward migration of the worms, a lid to keep the bin dark and prevent migration of the worms out of the trays and drainage on the bottom to drain excess moisture. Single closed containers should not be made of cardboard, Styrofoam or metal.

In a **stacked worm bin**, the trays are used in succession, each one coming on line after the one below fills up with compost. When it's time to move the worms, food and bedding gets placed on the next tray up; the trays are designed so that worms can indeed migrate to the next level. When they've left the old one behind, it can be removed and emptied — and then replaced at the top of the stack. As long as it's left empty, it has nothing to attract the worms. Only when food waste is present will worms move in.

Red Worms or (*Eisenia fetida*) are the best type of worm for eating food waste. These worms are surface worms and stay in the top 18 inches of the soil. It is usually best to keep them in a closed (but ventilated) container so you can keep the process going. Every three months the worms should be harvested separated from the castings if you are using a single closed container. In the case of a layered (stacked) setup a new tray should be added every 3 months or as necessary once the food supplies are exhausted and the tray is full.

## **Potential Problems:**

### **Unwanted Pests**

Creatures such as mites, potato bugs, mould, fungus and other worms are not harmful. They are actually, a vital link in the decomposition chain, eating what the red worms cannot.

Mould may be a sign that your worms are not decomposing their feed quickly enough. Fruit flies and their maggots may be annoying but the maggots are some of the most efficient decomposing agents. If you want to limit their intrusion:

1. When feeding, bury the new matter well below the top bedding
2. Place a few layers of damp newspaper over the compost
3. Hang a fly trap near of over the compost bin
4. If ants are a problem, the bin is too dry - add more moisture

### **Odour Problem**

If your worm bin has an unpleasant odour, one of the following may be the culprit:

1. Bin is too wet. Solve the problem by not adding any water or foods with a high percentage of water (e.g., melons) and by adding more dry bedding.
2. Bin does not get enough air. Anaerobic bacteria (bacteria which thrive without air) is smelly. To aerate, add fresh bedding and mix bin contents daily.
3. The food in bin is naturally smelly. For instance, we have found that onions and broccoli do not smell very pleasant when they decompose in the worm bin. Simply remove any food source that smells bad from the bin.
4. Bin contains non-compostables. Meat, bones, dairy and oily products should not be fed to the worms because these items become rancid when decomposing.

### **Worm Death**

If you notice the worm population dwindling, or worms crawling all over the bin trying to escape, check for the following:

1. Bin is too wet and worms are drowning.
2. Bin is too dry and worms dry out.
3. Bin does not get enough air and worms suffocate.
4. Worms do not get enough food. Once the worms devour all of their food and newspaper bedding, they will start to eat their own castings which are poisonous to them. **TIME TO HARVEST**
5. The bin is exposed to extreme temperatures. The worms thrive in temperatures from 55 to 77 degrees F (13 to 25 degrees C).

NOTE: Dead worms decompose rather quickly. If you do not monitor the above conditions you can have a dead box of worms before you even realize it.

If the worms are left in their waste products (castings) too long they will succumb. If too much moisture is added without drainage they will drown.

## **Pathogens**

Traditional compost heaps heat up during the decomposition process and get hot enough to kill pathogens, weed seeds and other problematic substances. In contrast, vermicompost bins must stay at a cool enough temperature to support earthworm life. So, vermicompost may still harbour pathogens and other problems.

## **Worms and the Northern Boreal Forest**

Earthworms are not native to most of Canada, having been wiped out in the last ice age. The worms here now were likely brought by European settlers in soil, with plants and on ships. The intruders are a gardener's ally, but the same actions worms are admired for — shredding organic matter and tilling the soil — are harmful to the boreal forest.

When they get into these native systems that have never had them, they are an ecosystem engineer. They change the system to suit themselves, and there is a “consequence”.

By decomposing the thick layer of leaf litter, earthworms alter which plants, invertebrates, birds and small mammals exist. American robins, for example, occur more often in locations where earthworms live.

If earthworms alter the boreal forest from a carbon sink to a carbon source, the consequences would be substantive.

Red Worms or (*Eisenia fetida*) that are used for vermicomposting will die when the temperature drops below freezing but they can still cause forestry damage if they are allowed to escape into the boreal forest.

## **Harvesting Time**

Harvesting the resulting soil amendment out of a vermicompost system requires careful sorting to take out the worms and save them on the side while collecting the soil amendment. This can be time-consuming, depending on the size of the vermicompost bin and how many worms were used. In contrast, a traditional compost heap can be used immediately by simply shovelling away the necessary amount of soil amendments with little need to sort, strain or filter its contents.

With the single bin vermicomposting system this sorting can be tedious in a tiered tray system one simply removes the bottom tray when it is full and put a new tray (with food for the worms) on the top of the other trays. The worms naturally migrate upwards to the new food source and there are very few (if any) worms in the bottom tray.

## Using Worm Compost

Worm compost can be used straight from the worm bin or stored for later use as a soil amendment, a slow-release fertilizer or in compost tea. As a soil amendment, worm compost can be blended with potting soil. Typically worm compost is used to make up ¼ to ⅓ of the total soil volume for container plants. It can also be added to garden soil when planting annuals, perennials, vegetables, trees and shrubs. Use it as a fertilizer by lightly topdressing houseplants and by spreading 1 to 2 inches around the base of flowers and vegetables. Avoid direct contact of the worm compost with stems or trunks. Steep worm compost in water overnight to solubilize nutrients and create “compost tea” for watering plants.

## References

1. Compost tea - *leaffin.com*
2. Worm Compost Bins - what to look for and what to avoid  
*www.best-organic-fertilizer.com.*
3. Raising Earthworms Successfully  
<http://infohouse.p2ric.org/ref/35/34577.pdf>
4. <https://web.archive.org/web/20160213203115/http://andreas-heeschen.co.uk/2016/02/02/build-your-own-worm-farm/>
5. Small Scale Vermicomposting  
<https://www.ctahr.hawaii.edu/oc/freepubs/pdf/HG-45.pdf>
6. Earthworm castings as plant growth material  
<http://www.bae.ncsu.edu/topic/vermicomposting/vermiculture/castings.html>
7. *The Worm Book: The Complete Guide to Gardening and Composting with Worms*  
By Loren Nancarrow, Janet Hogan Taylor
8. <http://www.metrovancouver.org/services/solid-waste/food-scrap-recycling/apartments-condos/multi-family-composting/composting101/Pages/default.aspx>  
Understand composting
9. <https://www.rdn.bc.ca/cms/wpattachments/wpID103atID2370.pdf>  
Regional District of Nanaimo Zero waste. Beyond recycling.
10. <https://m.extension.illinois.edu/homecompost/science.cfm>  
The Science of Composting
11. Recycling with Earthworms: The Red Wiggler Connection by Shelley C. Grossman and Toby Weitzel