

Vermicomposting

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Introduction

Vermes is Latin for worms and Vermicomposting is essentially composting with worms. In nature all organic matter eventually decomposes. In Vermicomposting you speed up the process of decomposition and get a richer end product called "worm castings." Vermicomposting has the added advantage of allowing you to create compost all year; indoors during the winter and outdoors during the summer.

The consumption of organic wastes by earthworms is an ecologically safe method to naturally convert many of our organic wastes into an extremely environmentally beneficial product.

Two types of earthworms have consistently been domesticated for commercial use due to their relative insensitivity to environmental changes.

- a) The Red Wiggler, or manure worm [*Eisenia Foetida*].
- b) The Red Worm, another manure worm [*Lumbricus Rebellus*].

Biology

The Red Wiggler ingests waste at the front, through a soft mouth with a lip that can seize or grasp whatever the worm is trying to eat. The throat, or "pharynx" can be pushed forward to help pull matter in. They have no teeth so they coat their food with saliva, which makes it softer and easier to digest. After the food is swallowed, it passes through the esophagus to the crop and then to the gizzard, where small stones grind it up. The food is passed into the intestine, which is almost as long as the worm itself. At the end of the intestine is the anus, for passing out the

castings.

Worms have a brain and five hearts. They have neither eyes nor ears but are extremely aware of vibrations such as thumps or banging on the composter. They have a well founded hereditary aversion to bright lights. Ultraviolet rays from the sun are very harmful to earthworms. One hour's exposure to strong sunlight causes partial-to-complete paralysis and several hours are fatal. A worm breathes when oxygen from the air or water passes through its moist skin into the blood capillaries. If the body covering dries up, the worm suffocates.

Reproduction

A worm's reproductive system is quite complex. Worms are hermaphroditic--that is, each worm is both male and female and each can produce eggs and fertilize the eggs produced by another worm. Under perfect conditions a mature breeder will produce a cocoon every 7 to 10 days. During mating, any two adult worms can join together to fertilize each other's eggs. Then a mucous tube secreted by the clitellum (the band 1/4 of the way down the worm's body) slips over its head into the soil as an egg case or cocoon. These cocoons are about the size of a match head and change color as the baby worms develop, starting out as pale yellow and when the hatchlings are ready to emerge, cocoons are a reddish-brown. It is possible by observing with a good lens to not only see a baby worm, but to see the pumping of its bright red blood vessel. The blood of a worm is amazingly similar to ours, having the same function of carrying oxygen, and having iron-rich hemoglobin at its base.

It takes about three weeks development in the cocoon for one to several baby worms to hatch. These newly emerged worms look just like the grown-ups, only lighter in color and much smaller. They will mature to breeding age in approximately 60 to 90 days.

Population Controls

Three basic conditions control the size of a worm population:

1. availability of food
2. space requirements
3. fouling of their environment

When food and waste is regularly fed to worms in a limited space, the worms and associated organisms break down this waste. They use what they can and excrete the rest. As the worms reproduce, the voracious young worms compete with their parents and all the other worms in the culture for the limited food available. Additionally, all the worms excrete casting, which has been shown to be toxic to members of their own species. As time goes on, more worms compete for the limited food, and more and more of the bedding becomes converted to castings. The density of the worms may exceed that favorable for cocoon production, and reproduction slows down. The controls you exert over your worm population will affect this whole process. You may

choose to feed an ever increasing population, in which case, you will need to provide them with more space and fresh bedding. No one knows for sure the life span of a worm. Some authorities believe that, under ideal conditions, worms may live as long as ten years.

Castings

When worms expel their manure there is a bit of mucus surrounding each granule. This hardens when it is exposed to air. When granular castings are mixed into garden or houseplant soils there is a slow "time release" of nutrients to feed the plants. However, the hardened particles of mucus do not break down readily, and they act to break up soils providing aeration and drainage, creating an organic soil conditioner as well as a super, natural fertilizer.

Castings compared to soil has:

- * 5 times the nitrate
- * 7 times the phosphorus
- * 3 times the exchangeable magnesium
- * 11 times the potash
- * 1.5 times the calcium

Worms are odorless and free from disease. It is common to use earthworms to aerate, sanitize and deodorize, such as under the cages of the evil agricultural machine.

Worm Bin Setup

The worm container can either be a plastic container or home-made from exterior grade plywood. A good size for a bin is 12" high x 16" deep x 24" long. The Rubbermaid Roughtote 53L container is a good size bin. This size bin will handle 3 pounds of garbage per week. An aeration hole should be cut in the top of the box. If more food is to be produced each week, several bins should be used. This will save all food scraps; as one bin is being finished off, the others can be in various stages of advancement.

On the bottom of the bin, place a grid of several pieces of wood or plastic (the grill from a fluorescent light works best) one inch off the bottom for drainage. On top of the grid, place mosquito netting or screen from a storm door to prevent the worms from crawling through and dying.

In a large container, thoroughly mix the bedding materials together with water, adding approximately two handfuls at a time. Test the bedding for water content by grabbing a fistful and squeezing it. If a few droplets of water appear through your fingers, there is adequate water for the worms. Never use water from a water softener as the salt will kill the worms. Put the mixed bedding in the bin. Do not pack it down - it should be light and airy. Place your red wigglers on top of the moistened bedding, keep the lid off and after a few minutes the worms

should all disappear into their new home.

Feed your red wigglers. The first few days, your worms will be adjusting to their new environment. Don't be alarmed if the odd worm becomes lost and tries to climb the wall of the bin; simply put them back in their bedding.

Location of Your Worm Bin

Your worm bin can be located in a number of places; kitchen, patio, garage, basement, closet. To keep your red wigglers happy, you will need to think about temperature, moisture and ventilation.

All worms need moisture. The bedding should have a moisture content similar to a wrung-out sponge. Worms also need oxygen. It is important to allow air to circulate around the bin by not covering the air holes. The red wigglers in your bin can tolerate a wide range of temperatures, but they should not freeze or get too hot.

Worm bins can be used indoors all year round, and outdoors during the winter months. Outdoor bins should be kept out of the sun and rain. When temperatures drop below 10 degrees C (50 degrees F) bins should be moved indoors.

Feeding Your Worms

Red wigglers will eat most of your kitchen waste. Any vegetable waste that you generate during food preparation can be used such as potato peels, carrots, lettuce, cabbage, celery, apples, banana peels, grapefruit and orange rinds, tea leaves, tea bags, coffee grounds, and paper filters.

Some wastes compost faster than others. Banana peels will take about a week, while orange peels will take about a month to decomposes.

Cutting the waste to be composted results in faster composting. The smaller the pieces the faster the moisture and bacteria will break them down for worm consumption. Pureeing is the most ideal.

Egg shells or calcium carbonate are needed to maintain the bedding at a safe pH level and act like a vitamin to the worms. Let the shells dry out, crush them and sprinkle at least one tablespoon in the bin every week.

Note: Avoid feeding your red wigglers meats, dairy products, eggs, oily foods, salt and vinegar.

Red wigglers will eat their own weight every day. This also includes their bedding so for every pound of red wigglers or part thereof, feed half that weight in food waste. Feeding twice a week or weekly is fine. Be careful not to over feed your red wigglers. Bury the food waste by pulling aside some of the bedding, dumping the waste, and then covering it up with some of the bedding.

Each time you feed your worms, choose a different location.

Harvesting Your Compost

Harvest your bin every three months for a healthy worm supply and a good mixture of castings and vermicompost. When you are ready to harvest, you will notice that the volume of material has dropped substantially and the original bedding is no longer recognizable. The contents will now be brown and earthy-looking. There are several ways to harvest:

1. Move the contents of the bin over to one side. Add fresh bedding (see section on bedding) to the vacant side. Put food waste in the new bedding. The red wigglers will gradually move over in search of food. After one or two weeks the finished compost can be removed.
2. Prepare new bedding. Dump the contents of the bin onto a large plastic sheet, and separate into small cone-shaped piles. Place a bright light above the piles. The worms will move down away from the light. Remove the compost from the top. Repeat this four or five times until a small pile of worms and compost remain. Place the worms and the compost in the bin with fresh bedding.
3. Remove the entire contents of the bin. Put in fresh bedding and food. Place a large piece of damp burlap over the bin ensuring that the burlap overhangs the edges of the bin. Place one inch of vermicompost on the burlap. With a bright light over the bin, the worms will move through the burlap and you can remove the finished compost.

Note: For the second and third methods, don't feed the worms for one or two weeks prior to harvesting.

Vermicomposting is organic, non-burning and rich in nutrients. It can be used for any garden project.

The Bedding

Suitable bedding materials include

- * shredded or mulched paper such as newspaper (no color)
- * computer paper and cardboard
- * shredded fall leaves
- * chopped up straw
- * sawdust
- * dried grass clippings
- * peat moss
- * Fibrous garden matter such as corn husks

Vary the bedding in the bin to provide more nutrients for the red wigglers and to create a richer compost. The quantities of each is not important, as you cannot make wrong bedding if using the above materials.

Troubleshooting

The best approach is prevention. By always burying the food waste you will discourage fruit flies. Keep a tight lid on the container you use to store waste before adding them to the bin. This will prevent flies from laying eggs in the scraps. [This does not help if your kitchen is infested with fruit flies, in which case all the peels of your kitchen fruit will have fruit fly eggs.]

It is unlikely that your worm bin will have an unpleasant odour. If it does, there are a number of possible causes and steps you can take to remedy the problem.

1. You have overloaded your bin with too much food waste. Solution: Don't add any more food for a week or two.
2. The bedding is too wet and compacted. Solution: (a) gently stir the entire contents to allow more air in and stop adding food waste for a week or so. Make sure that your food waste is still buried. (b) The lid can be removed or left slightly ajar to allow the contents to dry out.
3. Your bin is too acidic. Solution: Add some calcium carbonate and cut down on the amount of citrus peel and other acidic food waste.

Remember

Worms hate light and prefer to remain in the dark of their bin. They will not leave their home. They are very sensitive to vibrations. Please try not to disturb them unnecessarily.

Worms are living creatures with their own unique needs, so it is important to create and maintain a healthy habitat for them to do their work. If you supply the right ingredients and care, your worms will thrive and make compost for you.

Happy and successful vermicomposting!

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