Denver Urban Gardens School Garden and Nutrition Curriculum

Worm Composting 101

Resource Sheet

Why Compost?

Recycling the organic waste of a household into compost allows us to return badly needed organic matter to the soil. In this way, we participate in nature's cycle and cut down on garbage going into burgeoning landfills while improving the quality of our soil.

Why Compost with Worms?

Worm composting is a method for recycling food waste into a rich, dark, earth-smelling soil conditioner. The great advantage of worm composting is that this can be done indoors and outdoors, thus allowing year round composting. It also provides apartment dwellers with a means of composting. In a nutshell, worm compost is made in a container filled with moistened bedding and red worms. Add your food waste for a period of time and the worms and microorganisms will eventually convert the entire contents into rich compost.

This brief introduction to worm composting is only a basic guide and so we recommend that you also read the books cited at the end of this document. They are full of useful and fascinating details about this process.

Important things to know about a worm compost bin:

- The bin needs a cover to conserve moisture and provide darkness for the worms. If the bin is indoors, a sheet of dark plastic or burlap sacking placed loosely on top of the bedding is sufficient as a cover. For outdoor bins, a solid lid is preferable, to keep out unwanted scavengers and rain. Worms need air to live, so be sure your bin is sufficiently ventilated.
- If using plastic bins, the colored Rubbermaid “Roughneck” storage containers from 10 to 18 gallon size are preferable. Drill 30 quarter inch holes on each of the long sides and the bottom of the box. Provide another lid to collect any drainage from the moistened bedding. To provide additional aeration use a few bricks or boards placed underneath the box to elevate it from the bottom catchment tray.
- Worms: The two types best suited for worm composting are the red worms: Eisenia foetida (commonly known as red wiggler, brandling or manure worm) and Lumbricus rubellus. They are often found in aged manure and compost heaps. Please do not use night-crawlers (the big earth worms found in soil outside) they are not likely to survive.

Preparing the Worm Bedding

There are many suitable bedding materials for your worm bin. The ideal bedding is light and fluffy. Some options include:

- Leaves: Chop the leaves slightly and mix them with a little compost, straw, shredded newspaper or chopped corrugated cardboard to prevent matting down, which excludes air leading to odor problems and suffocating worms. Avoid using leaves from heavily traveled streets due to possible contamination from traffic. Do not include pine needles, grass clippings or branches. It is best to avoid leaves from oak or cottonwoods.
- Paper: Shredded or torn strips of black and white newspaper mixed with a little compost to provide starter decomposer microorganisms. It is useful to mix newspaper with another bedding material, such as leaves or straw and fluff all moistened materials.

- Corrugated Cardboard: Mix shredded material with leaves and a few handfuls of compost. Use only cardboard that is free of wax, herbicide, pesticide and bleach. Avoid using paperboard, the material typically used for cracker, cereal or shoeboxes because it contains waxes and glues that harm the worms.

Some people add several handfuls of soil to their choice of bedding material. Since worms have no teeth the soil helps them break down food particles in their gizzard by providing a source of grit.

All material used as bedding must be kept moist, like a wrung-out sponge. Materials should be moistened before worms and food are introduced to the system. To moisten the bedding, add water in a ratio of 3:1 by weight of water to bedding. Once all the water is mixed in, (no water lingering in the bottom corners and all bedding materials moist) dump the worms over the surface of the moistened bedding and allow the worms to burrow down in the bedding before adding their first meal.

Feeding the Worms

Food scraps should be buried in a grid. Divide the surface of the bin into an imaginary grid of nine or more squares. Once or twice a week, bury chopped-up food scraps about 1 ½" to 2" into the bedding. Each time you bury food use a different square on your imaginary grid until each square has been used. Then start over again with the same rotation.

It is possible to over feed your worms, creating a temporary situation in which unwanted odors build up. With the passage of time, the anaerobic conditions producing the initial odors will lesson if no fresh wastes are added and bedding materials are fluffed up (to increase aeration).

Most inhabitants of a properly managed worm bin should pose no threat to the health of your worms. However, centipedes are predators and should be removed. To prevent build-up of fruit fly or fungus gnat populations, remember to bury all food 1 ½" to 2" in the bedding material.

How Many Worms Do I Need?

The correct ratio of worms to food waste should be: for one pound per day of food waste, use two pounds of worms (roughly 2000). If you are unable to get this many worms to start with, reduce the amount of food waste accordingly while the population steadily increases.

How Do I Maintain My Bin?

If you have the correct ratio of surface area to worms to food scraps, other considerations would be to mix food with worms and bedding on a weekly basis. After about two months, there should be little or no original bedding visible in the bin and the contents will be brown and earthy looking worm castings. The contents will have substantially decreased in bulk too.

As the bin matures, there will be an increase in the number and diversity of organisms living there. This is a good sign, as they are an integral part of the composing food web.

Do not add water to the bin, unless a large part of the bin material is dry. Dig under the bedding every few weeks to peek at the bottom most material to check on the moisture. If even a little bit is becoming waterlogged, then you need to promote more aeration by mixing up the bedding and breaking apart the clumps.

Smell the bin. If there is any foul odor, think about what you may have done different recently. Odors are a clue that conditions have become anaerobic. Foul odors could be caused by adding excessive amounts of food, not mixing the bedding weekly, or adding too much water.

It is important to separate the worms from the finished compost; otherwise the worms will begin to die. There are several ways to do this. The quickest is to move the finished compost to one side of the bin. Place new moistened bedding and food waste in the space created. The worms will gradually move over and the finished compost can be skimmed off as needed.

If you have the time or want to use all the compost, you can dump the entire contents of the bin onto a large plastic sheet and separate the worms manually. Make many small piles of bedding and gradually move the top layers aside. The worms will migrate down further into the pile to escape the light. After around 15 minutes most mature red wigglers will be at the bottom of the pile and the castings can be removed. Most children love to help with this process and you can turn it into a fun lesson about worms for them. Watch out for the tiny, lemon-shaped worm cocoons which contain between two and twenty baby worms! By separating the worms from the compost, you save more worms for your next bin. Store the compost in plastic bags for use as required.

Where Should I Locate My Worm Bin?

Worm bins can be used indoors all year round and outdoors during the milder months. The advantage of mobile bins is that they can be moved when weather conditions change. Indoors, basements are excellent locations (warm, dark and dry), but any spare space can be utilized, so long as temperatures are between 40-80 degrees F. We know dedicated worm composters who have convenient kitchen counter worm bins. Outdoors, bins can be kept in sheds and garages, on patios and balconies or in the yard. They should be kept out of hot sun and heavy rain. If temperatures drop below 40 degrees F., bins should either be moved indoors or well insulated outdoors. Elevate the worm bin slightly so airflow can reach the bottom.

Red Wiggler Worms:

- Consume their weight each day in raw organic matter
- Lay 2-4 light colored cocoons per week, which will hatch 2-3 baby worms after 3 weeks
- Live for about 1 year
- Take only 6 weeks to grow from hatchling to mature adult
- Do NOT turn into 2 worms when cut in half and could die if this happens

Sources

Elcock, Gillian and Josie Martens. *Basic Guide to Worm Composting*. City Farmer, 1995.

Payne, Binet. *The Worm Café: Mid-Scale Vermicomposting of Lunchroom Wastes*. Flower Press, Kalamazoo, MI: 1997.

Denver Recycles and Denver Urban Gardens. *Denver Master Composter Resource Manual.* Denver Master Composter Training and Outreach Program.