

## The Oklahoma Cooperative Extension Service Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.



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# Vermicomposting – Composting With Worms

Oklahoma Cooperative Extension Fact Sheets  
are also available on our website at:  
<http://osufacts.okstate.edu>

## What is Vermicomposting?

Vermicomposting is composting with worms. The *vermi* in vermicomposting comes from the Latin word for worm – *Vermis*. Vermicomposting differs from normal, or microbial, composting. In vermicomposting, worms do most of the work breaking down organic matter instead of fungi and microorganisms. There are other differences: vermicomposting bins do not heat up, and bins do not need turning. You do not even have to touch a worm.

## Why Compost with Worms?

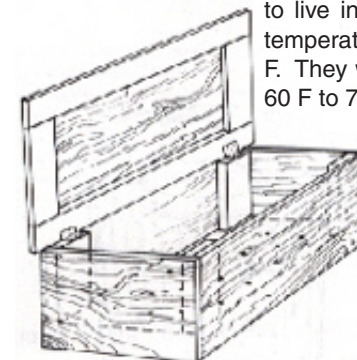
The average American creates 4.3 pounds of waste each day. Nine percent of this is food waste, 14 percent is yard waste and 32 percent is paper and paperboard. All of this is organic matter that can be composted or vermicomposted. By removing the organic portion of the waste stream by home composting, residents can reduce the cost of municipal solid waste collection and disposal, prolong the life of landfills, add value nutrients and organic matter to soil and reduce the amount of chemical fertilizers used in gardens and lawns.

## Kinds of Worms

A number of different species of earthworms have been used in vermicomposting, but the only one currently recommended for use is *Eisenia fetida*. These worms go by many common names, but the two used most often are **Red Wiggler** and **Tiger Worm**. They are called Red Wigglers because they are reddish in color and squirm around when agitated or exposed to sunlight. They also are called tiger worms because when they stretch, tiger worms show alternating red and buff colored bands. *Eisenia fetida* is the only earthworm with this tiger stripe pattern.

Red wigglers reproduce quickly, are naturally adapted to life in a bin and are voracious eaters. They are relatively small – less than three inches long when not stretching. They prefer to live in dark, wet places and tolerate temperatures from nearly freezing to 80 F. They work best at temperatures from 60 F to 75 F, and begin to die when their bin temperature exceeds 85 F.

Purchase Red Wigglers or Tiger Worms from established worm farms. They also are sold over the internet and can be shipped to any location. Do not buy red worms from bait



stores, as these are usually other types of worms, many of which are invasive species. To start a worm bin, buy one pound of compost worms per square foot of bin surface.

## Kind of Bin Needed

There are several types of commercial bins available. Homeowners can choose to make their own from a variety of materials, such as plastic storage boxes, washtubs and wooden crates. One man even buried an old refrigerator in the ground to use as a worm bin. The container should have a secure and removable lid to keep out flies, cats and rodents. Ventilation holes around the lid and top of the bin should be small to keep out flies. Larger (1/8-inch) holes drilled in the bottom will relieve excess moisture. Place a large tray under the bin to collect seepage. The excess moisture seeping out of the bin is called leachate or vermicompost tea. It is excellent liquid plant food.

The bin should be large enough to accommodate the amount of food produced by the household. A good rule of thumb is 2 square feet of bin surface area per person contributing to the bin. The goal is to spread a thin layer (1/4 to 1/2 inch deep) of food scraps per week. For two people, a container 2 feet by 2 feet should do. The bin should be 12 to 24 inches deep.

## What do Worms Eat?

Worms eat just about any kind of organic matter: coffee grounds and filters, tea bags and tea leaves, vegetable and fruit scraps, breads and grains, uneaten cat and dog food. Do not feed greasy food, meat and dairy products or pet waste. Worms do eat this stuff, but flies and maggots eat it faster and will take over the bin. Worms do not eat plastic, rubber, cellophane, bones or twigs. They will ingest and pass egg shells if they are ground into small pieces.

## How are Worms Fed?

Worms like a higher carbon diet than microbial composting. One way to manage this is to spread the “green” material (food scraps, coffee grounds, etc.) thinly across the bin and lightly cover with a layer of “browns” (dried fallen leaves or shredded paper). Spread the next layer of greens on top of the browns. Keeping a layer of higher-carbon brown material

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## Troubleshooting Guide for Worm Bin Problems

<i>Problem</i>	<i>Cause</i>	<i>Solution</i>
Rotten Odor	Too much food	Cover exposed food with brown material, stop feeding for a week.
	Food exposed to air	Cover exposed food with brown material
	Greasy or meaty food Not enough air	Remove Drain moisture, fluff material
Bin attracts flies	Too much food	Cover exposed food with brown material, stop feeding for a week.
	Air holes too big	Cover holes with netting
	Bin has become acidic	Remove citrus peels Sprinkle top of bin with ag lime, fluff bedding
Bin full of Sow Bugs and Rolly Pollies	Woodlice thrive in the same conditions as compost worms	Clean the bin. Spray with Pyrethrin before restocking with worms.
Mold is forming in bin	Bin has become acidic	Remove citrus peels, Sprinkle top of bin with ag lime, fluff bedding
Water running out of bottom	Bin is too wet	Drain, add dry bedding or brown material, fluff bedding.
Worms escaping or dying	Bin is too hot	Move to a cooler area
	Bin is too dry	Spray water to moisten, fluff
	Bin is too wet	Drain, add dry bedding or brown material, fluff
	Not enough bedding	Add bedding material so the worm bed is 6 to 10 inches deep.

over the quickly decomposing greens reduces odors and flies. It is a great way of getting rid of junk mail too.

### Bedding

In nature, composting worms eat organic matter on wet forest floors and transfer nutrients downward through the forest litter. The community of worms creates a bed of fluffy material they wiggle through and aerate every day. When starting a bin, put some starter bedding in the bin before adding worms. Eventually the bedding and food get mixed by compost worms and become vermicompost. Bedding should be lightweight, biodegradable and retain moisture. The best bedding is old compost. Other bedding items are shredded paper mixed with soil, peat moss and coconut fiber (coir). The bedding should be moist. Wet it, then wring out the excess moisture and fluff it up. Spread the bedding evenly in the bin 6 to 10 inches deep.

### Where to Put the Bin

Keep in mind the optimum temperature range of red wigglers (60 F to 75 F) when positioning the bin. Basements and cellars are ideal for year-round vermicomposting. Many people keep a small bin under the kitchen sink or in a laundry room, but do not over-feed, since this attracts flies. Attached garages are fine in winter, but are too hot during Oklahoma summers. During summer, place the bin outside in the shade or on the north side of the house. Add water to the bin to keep it cool and moist in the summer. To keep the bin thoroughly cool, add ice in a separate tray above the bin and allow cool water to drip down onto a layer of shredded paper above the worm bed.

Nitrogen, 0.5 to 1.5 percent  $P_2O_5$ , and 1 to 2 percent  $K_2O$ . Carbon-to-nitrogen ratio of mature vermicompost is less than 15-to-1.

**As a soil amendment:** mix ½ to 1 inch of vermicompost into 6 inches of soil.

**As mulch:** Spread ½ to 1 inch of vermicompost beneath canopy of growing plants out to the point where rain drips from leaves.

**In a seedbed:** Place ½ to 1 inch of vermicompost in the bottom of the furrow. Place seeds on top of vermicompost.

**In potting mix:** use 1/4 to 1/3 vermicompost by volume. Vermicompost is a stable product, but it does not go through a heating process. Therefore, the 90/120 rule should be followed when using vermicompost in vegetable production: Vermicompost application should occur 90 days before harvest of vegetables whose edible parts do not come in contact with the soil. Vermicompost application should occur 120 days

before harvest of vegetable crops whose edible parts come in contact with the soil.

There is no restriction on applying vermicompost to ornamental and other non-edible plants.

### Troubleshooting

Once established, a vermicomposting bin requires little attention. However, problems can arise. The troubleshooting table can help diagnose and cure problems.

### References

- Hamilton, Doug. (2016). Oklahoma Cooperative Extension Service publication. BAE-1528, The Basics of Vermicomposting.
- Hillock, David. (2016). Oklahoma Cooperative Extension Service publication. HLA-6448, Backyard Composting in Oklahoma.

### Harvesting Compost and Worms

Compost worms turn feed and bedding into rich, dark compost in two to five months. Harvest vermicompost two or three time per year. Here are two ways to harvest worms and compost:

1. Dump the bin into several small piles onto a plastic sheet under a bright light or in full sunlight. Worms hate light and will retreat to the center of the pile. Every few minutes brush compost off the top of the pile. Within half an hour, nothing will be left but little balls of worms. Return the worms to a bin full of fresh bedding and begin to feed. Use the compost in the garden.
2. Do not feed the bin for about a week. Make a small mound in the middle of the bin. Soak this mound with diluted molasses. The worms will migrate towards the molasses in about two hours. Remove the ball – worms, vermicompost and all – and use to start a new bin. Start feeding the new bin and use the remaining vermicompost in the old bin in the garden. It may take two or three times to remove all of the worms from the old bin, but you will be left with about half of the contents of the old bin to use in the garden.

### Vermicompost

#### in Gardens and Landscapes

Vermicompost can be used immediately or stored for later use. It is very rich in nutrients. Dry food-scrap-shredded-paper based vermicompost has a fertilizer value of 1 to 7 percent