"Compost-ology"

The Science & Fun of Composting & Vermicomposting

composting

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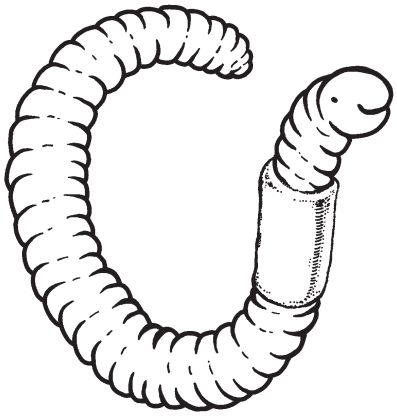

vermicomposting

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healthy planet

Acknowledgements

Thanks are extended to The Composting Council and
the Texas Commission on Environmental Quality.

Original illustrations are by Nancie McCormish
Drawn by Design, Lanesboro, MN

Compost-ology: the Science & Fun of Composting & Vermicomposting
is distributed by
The City of Euless
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Prepared in cooperation with the North Central Texas Council of Governments
through funding from the Texas Commission on Environmental Quality.

Contents

Recycling in Nature

Composting is nature's way of recycling organic materials. All living things are organic and will naturally decompose. In natural systems, dead plants and animals fall to the ground and are decomposed by bacteria, fungi and other organisms. When people manage this process to turn organic materials into soil amendments, it is called composting.

Compost is the dark, loose, earthy-smelling material found on the forest floor, under the grass in a meadow and under a pile of old leaves in your garden.

Compost includes both stabilized organic material and the living organisms which continually recycle nutrients from dead plants and animals. The finished compost and the organisms that make it are each vital to the health of plants, soil and entire ecosystems.

What is Backyard Composting?

Backyard composting refers to a variety of practices individuals can use to manage organic materials at home. All backyard composting techniques utilize the natural activity of bacteria, fungi and other soil organisms to decompose organic materials and return them to the soil. Decomposed organic material — compost — is essential to healthy gardens and landscapes.

The Benefits of Backyard Composting

Backyard composting can be the most economical and environmental way to manage organic materials produced at home. The benefits include:

- **Diverts Organic Material from Landfills** – Keeping these materials at home prolongs the life of landfills and reduces the expenses and environmental impacts associated with them.
- **Saves Money** – Every pound of organic material composted at home is one less that must be collected, transported and deposited in landfills. Residents who compost also get a free soil amendment which improves the health of their garden and reduces maintenance costs.
- **Improves Soil and Plant Health, Conserves Water and Reduces Use of Garden Chemicals** – Use of compost improves any soil. Compost makes soil better able to absorb and return moisture; reducing runoff, erosion and irrigation needs.

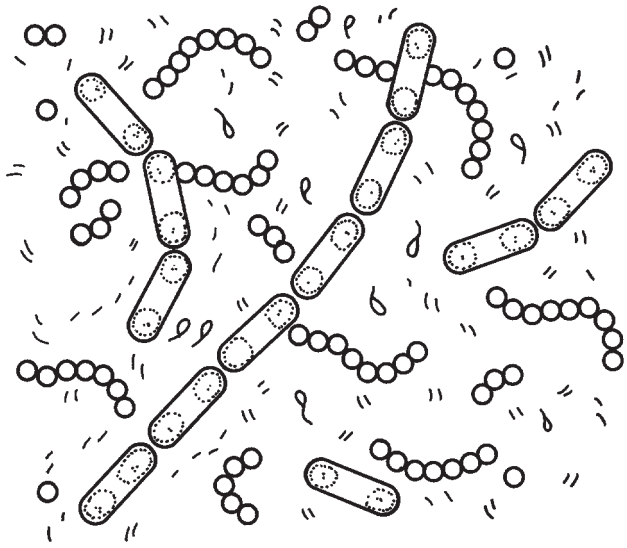
The Biology of Composting

Composting involves a wide variety of organisms which are naturally present in organic matter. Bacteria perform the primary breakdown of organic materials and generate the heat associated with composting. Other composters, including microbes, fungi, worms and a host of invertebrates also take part in the composting process. The make-up and conditions of organic materials influence how long composting takes.

Bacteria are the Powerhouse of the Compost Pile

Bacteria perform the primary breakdown of organic materials and generate the heat associated with composting. Bacteria don't have to be added to the compostpile . They are present virtually everywhere and enter the pile on every single bit of organic matter. Many types of bacteria participate in the composting process, thriving at different temperatures and on different materials.

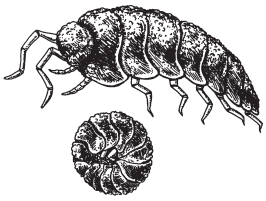
- **Psychrophilic** – First wave of microbial activity. They do their best work at 55ºF, but can carry on right down to 0ºF. As they eat away at organic materials, they give off a small amount of heat.
- **Mesophilic** – Second wave of microbial activity. Most of the decomposition in a compost pile is mesophilic. They do their work at temperatures between 70ºF and 90ºF.
- **Thermophilic** – Third and final wave of microbial activity. At 100ºF, the thermophiles take over and raise the temperature to about 160ºF. However, the highest range temperatures last only 3 to 5 days as the microbes use up the air and moisture in the compost pile.



bacteria

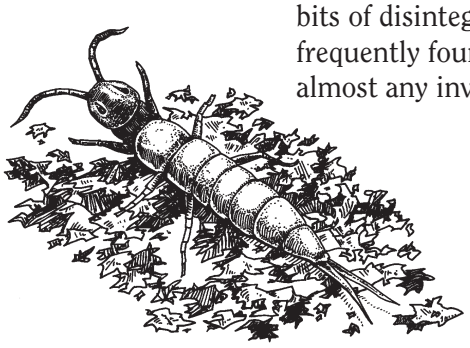
Nonbacterial Composters

In addition to bacteria, primary decomposers include actinomycetes, fungi, redworms, sowbugs, slugs and snails. It is useful to be aware of their value, lest they be mistaken as pests.



sow bugs

mites

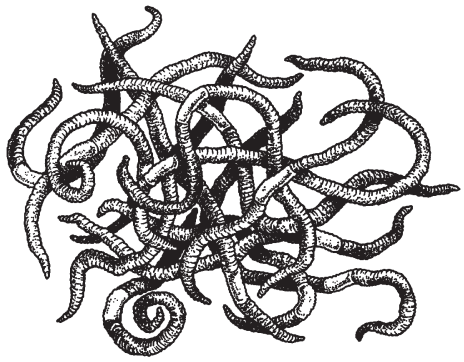


springtail

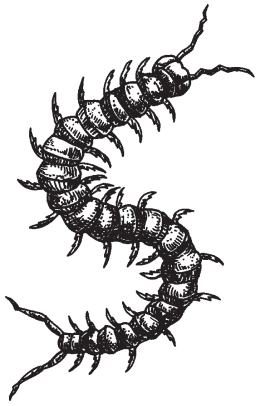
Actinomycetes produce greyish growths throughout compost and give the pile a pleasing, earthy smell. They thrive on woody materials and survive in a wide range of conditions. **Sow bugs** feed on woody materials and durable leaf tissues, and are often mistaken as pests. **Worms** play an important part in breaking down organic materials and stabilizing finished compost. They coat organic materials with a mucus-like film that binds small particles together and protects nutrients from leaching.

Second- and third-level decomposers feed on organic materials and on primary decomposers and their wastes. Common examples include nematodes, mites, springtails and centipedes. **Nematodes**, or roundworms, are the most abundant invertebrates in the soil. They prey on bacteria, protozoa, fungal spores and each other. Mold **mites** feed on yeasts in fermenting materials. **Springtails** feed principally on fungi, although they also eat nematodes and small bits of disintegrated organic matter. **Centipedes** are frequently found in compost piles. They prey on almost any invertebrate near their size or smaller.

actinomycetes



worms



centipede

Factors Affecting the Composting Process

Five factors influence how long composting takes and how much heat is generated.

- carbon and nitrogen content of materials
- size of particles
- moisture content of materials
- aeration of materials in the compost
- volume of materials

With ideal composting conditions, high temperatures will be generated to destroy weeds and pathogens and organic materials can be composted in several weeks. In less than perfect conditions, decomposition may take several months or even years. But remember that, as with all organic materials, composting will happen in a matter of time.

Carbon and Nitrogen Content of Materials

Combining "green" and "brown" materials can create a mix with the optimal carbon to nitrogen ratio. The optimum mix for simple backyard composting is half grass clippings and half leaves.

- Green plant material such as grass clippings typically are relatively rich in nitrogen.
- Brown plant materials such as fall leaves and branches are relatively high in carbon.

Particle Size

Small particles decompose quicker than larger ones, because more of the total volume is exposed to decomposers. Chopping or shredding coarse and woody materials before adding them to the compost pile increases the surface area accessible to decomposers and therefore speeds up the composting process.

Moisture and Aeration

A balance of air and water must be maintained for rapid decomposition to take place.

- Too much air circulating in the pile can make the pile too dry for bacteria and other decomposers to function. Inadequate moisture is the most common problem limiting backyard compost piles.
- If the pile is too wet, anaerobic bacteria, which thrive in the absence of air, can take over the pile. Anaerobic decomposition is slow, produces an odor similar to rotten eggs and by-products that are toxic to plants. Compost piles can also become anaerobic due to the settling of materials during decomposition, which prevents air flow. This is a common problem with composting grass clippings.

The optimal moisture level for composting is 40 to 60 percent — about as moist as a wrung-out sponge. This level of moisture provides organisms a thin film of water on materials, while still allowing air into pore spaces.

- If a pile is too wet or compacted, it should be turned (pulled apart and restacked) or "fluffed" with a garden fork, to allow air back into the pile. Mixing in coarse materials, such as leaves, also helps to aerate compost piles.
- If a composting pile becomes dry, it needs to be pulled apart and watered as it is restacked. Watering an intact pile is not an effective way to moisten a dry pile because dry organic materials often shed water like a rain coat. Dry materials should be gradually wetted with a fine spray and mixed until they glisten with moisture.

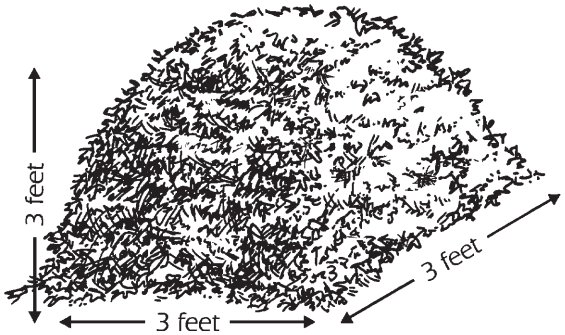
Cover compost piles once materials are uniformly moist to retain moisture and prevent nutrients from leaching out in rainfall. Plastic sheeting, burlap scraps, straw or plywood laid directly on a pile can help to maintain moisture.

Volume

For efficient composting, a compost pile must be large enough to hold heat and moisture, but small enough to admit air to the center.

A pile that is approximately one cubic yard (3 ft. tall x 3 ft. wide x 3 ft. long) is optimal for home compost piles.

- Small piles dry out quickly and cannot retain the heat required for quick composting.
- Piles that are larger than 5 ft. tall by 5 ft. wide of any length must be turned frequently or have air blown through the pile to prevent anaerobic conditions.



Optimal compost pile size

Time and Temperature

Compost piles made with the proper balance of materials, particle size, moisture, aeration and volume will decompose faster and at a higher temperature than piles with an imbalance of any of these factors.

- A compost pile that is made with the proper materials can heat up to 170ºF and produce usable compost in as short as one month. However, it is best to keep temperatures below 140º to avoid killing beneficial organisms and losing nutrients. Turning a hot pile will cool it off.
- With less attention to the materials used and the environment provided for them, composting will be cooler and slower, but will still produce good compost.

Compost Recipes

Cold Compsting (Cool and Easy)

Advantages

- low maintenance
- can add materials as they become available

Disadvantages

- doesn't heat up enough to kill weed seeds
- may create unpleasant odors if carbon/nitrogen ratio and balance between wet & dry materials are not maintained

Ingredients

- grass clippings
- brown leaves
- twigs
- water

Tools

- garden fork
- water hose with spray head
- compost bin (optional)
- burlap scraps or black plastic to cover top of pile (optional)

Directions

1. Set compost bin or start pile in an area where it is sure to get rained on, yet preferably out of direct summer sunlight.
2. Put yard trimmings in bin or pile as collected from garden cleanup or mowing. Moisten dry materials as they are added. Mix grass clippings with leaves or composting materials already in pile.
3. Chop or shred woody trimmings over 1/2 inch diameter if adding large amounts.
4. Cover top of pile with burlap scrap or black plastic to keep materials moist but not too wet.

Ready

When material at the bottom of the pile looks like dark, rich soil, pull aside undecomposed materials to start a new batch. Harvest the finished compost to use in the garden.

Hot Compsting (Hot and Fast)

Advantages

- heats up enough to kill most weed seeds and pathogens
- uses space efficiently

Disadvantages

- labor intensive
- must be built all at once, requiring storage of materials until enough is collected
- requires careful control of moisture and carbon/nitrogen ratio

Ingredients

- grass clippings
- brown leaves
- twigs
- water

Tools

- garden fork
- water hose with spray head
- compost thermometer
- compost bin (optional)
- burlap scraps or black plastic to cover top of pile (optional)

Directions

1. Set compost bin or start pile in an area which it is sure to get rained on, yet preferably out of direct summer sunlight.
2. Chop or shred woody trimmings over 1/2 inch diameter if adding large amounts.
3. Lay 6 inches of chopped "brown" trimmings and leaves at bottom of bin or pile. Moisten materials as they are added.
4. Add 6 inches of "greens" – grass clippings. Moisten.
5. Mix layers with a garden fork and moisten dry materials.
6. Repeat Steps 3 and 4 until a pile at least 3 ft. x 3 ft. x 3 ft. is made, or until the bin is full.
7. Monitor heat in pile using a compost thermometer. When pile has heated and starts to cool (about one week) turn it. Using a garden fork, move the material, shaking it in order to add air around the particles.
8. Repeat Step 7 in one week. Repeat until pile does not reheat after turning (about four weeks).
9. Let cure for two weeks before using.

How to Build A Compost Pile: Step by Step

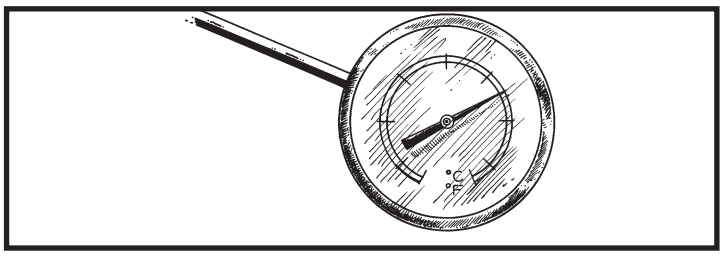
1 gather materials

2 start with bottom layer of leaves – "browns"

3 add layer of grass clippings – "greens"

4 add water until materials are damp

5 Repeat steps 2 through 4 until bin is full or pile is one cubic yard in size.



6 check the temperature with a compost thermometer

7 turn the pile when the temperature declines – if the materials are dry, add water

Compost Pile Ingredients: Yes or No

N*ote:* The presence of a C, N or O in the C:N column indicates whether the C:N values of the material tend to be carbonaceous (C), nitrogenous (N) or other (O).

MATERIAL	USE?	C:N	COMMENTS
Algae and seaweed	Yes	N	Good nutrient source.
Ash from charcoal or coal	**No**		**Contains sulfur dioxides, may harm plants in the garden.**
Ashes from wood fireplace or stove	Yes, but very alkaline materials	O	Can cause nutrient imbalance problems. Use no more than a fine sprinkling every 18 inches or so.
Bird droppings	**No**		**Droppings from pet birds may contain disease organisms and weed seeds.**
Cardboard	Yes	C	Best if shredded into small pieces. Glue is usually organic.
Cat feces or litter	**No**		**May contain disease organisms.**
Cottonseed meal	Yes	N	Can be used as a source of nitrogen in the fall when green grass clippings are scarce. Use the amount in a large coffee can for each nitrogen layer.
Dog droppings	**No**		**May contain disease organisms.**
Diseased plants	**No**		**Piles often do not get hot enough to destroy all diseases.**
Dryer lint	Yes	N	May need to be moistened.
Food scraps	**No**		**May attract rodents and other pests.**
Hair	Yes	N	Add moisture and mix thoroughly in the pile.
Manure (horse, cow, pig, sheep, goat, chicken, rabbit)	Yes	N	Excellent source of nitrogen. Fresh manure has a high water content; mix with drier materials.
Newspaper	Yes	C	Recommend shredding into small pieces. Most inks today are safe for garden use.
Pine cones and needles (redwood, eucalyptus)	Yes, but use sparingly	N	Recommend shredding and adding in small quantities. Other compost pile materials will neutralize their acid effect.
Sawdust and wood shavings	Yes, but may need to add extra nitrogen	C	Has a high carbon content. Avoid sawdust from pressure-treated wood.
Weeds	Yes, but not seeds or spreading roots	N	Annual weeds which have not gone to seed can be composted. Plants that spread through roots or runners should be spread on pavement to dry thoroughly before adding to compost.

Tro ubleshooting Compost Piles

SYMPTOM	POSSIBLE CAUSE	POSSIBLE SOLUTION/ALTERNATIVE
Compost pile is damp and warm in the middle, but nowhere else.	The pile may be too small.	Gather enough materials to form a pile 3 ft. x 3 ft. x 3 ft. and/or insulate the sides and cover the top.
Compost pile isn't heating up.	If it seems damp and sweet-smelling, there may be a lack of nitrogen.	Mix in fresh grass clippings, manure, blood meal or other material high in nitrogen. If it is difficult to turn the pile, create holes in the pile and add the nitrogen-rich material.
	Not enough oxygen.	Turn or fluff the pile.
	Cool weather.	Increase pile size and/or insulate it with straw or plastic cover.
	The pile may be too small.	Gather enough material to form a pile 3 ft. x 3 ft. x 3 ft. and/or insulate the sides and cover the top.
	Pile was built over several months.	Don't worry about it. Let pile compost "cold." Check for finished compost.
	Compost may be finished.	If it looks dark and crumbly and smells earthy (not moldy or rotten), it may be done. Use it!
The pile is dry throughout.	Lack of water.	Turn the compost and add water. Moisten new materials before adding to the pile. If the pile is out in the open, consider covering with straw or plastic cover. The pile should be as damp as a wrung-out sponge throughout.
Matted, undecomposed layers of leaves or grass clippings.	Compaction, poor aeration.	Break up layers with garden fork, or shred them, then relayer pile. Avoid adding heavy layers of leaves, grass clippings, hay or paper unless first shredded.
Large, undecomposed items.	Size and composition of materials.	Screen out undecomposed items, reduce size if necessary and use in a new pile.
Compost pile has a bad odor like a mixture of rancid butter, vinegar and rotten eggs.	Not enough oxygen, too wet.	Turn the pile and add coarse, dry materials such as leaves to soak up excess moisture. Protect the pile from rain using a plastic film or other cover.
	Not enough oxygen, compacted.	Turn the pile and shake materials apart to aerate.
Compost pile has a bad odor like ammonia.	Pile may have too much nitrogen.	Add materials high in carbon such as shredded leaves and aerate.
Compost pile contains fire ants.	Lack of water.	Turn the pile and add water. In order to keep fire ants out of the pile, pour molasses powder around the perimeter of the pile.
Compost pile contains earwigs, slugs and/or other insects.	Pile is composting correctly.	Insects are a good sign of a productive compost pile. Note: slugs live happily in compost piles. If the pile is next to a garden, barriers can be placed between the pile and nearby garden with traps, metal flashing, etc.

Checkpoints for Finished Compost

These points will serve as a standard from which you can determine the efficiency of your composting method.

Structure

Material should be medium loose, not too tight, not packed and not lumpy. The more crumbly the structure, the better it is.

Color

A black-brown color is best. Pure black, if soggy and smelly, denotes anaerobic fermentation with too much moisture and lack of air. A grayish, yellowish color indicates water-logged conditions.

Odor

The odor should be earth-like, or like good woods soil or humus. Any bad smell is a sign that the fermentation has not reached its final goal and that bacterial breakdown processes are still going on. A musty, cellar-like odor indicates the presence of molds, sometimes also a result of hot fermentation, that has led to loss of nitrogen.

Moisture

Moisture content should be like that of a damp sponge.

Compost Uses

Compost is a valuable resource for soil improvement. Compost is useful to the home gardener, in the restoration of landscapes where topsoil has been removed or compacted and to restore agricultural and forest lands.

Compost is typically applied in three ways:

- To mulch or "top dress" planted areas.
- To amend soil prior to planting.
- As a component in potting mixes.

Using Compost as Mulch

Compost can be used to mulch annual and perennial plantings, shrubs and trees, and as a top dressing for lawns.

On flower and vegetable beds:

- Remove weeds and grass that may grow through mulch.
- Screen or pick through compost to remove large, woody materials. They may be unattractive and will compete for nitrogen if mixed into the soil.
- Apply 1 to 3 inches of compost over the entire bed, or place in rings around each plant that extend as far as its outermost leaves.
- Always keep mulches a few inches away from the base of the plant to prevent damage by pests and disease.

On lawns:

- Sift compost through a 1/2 inch or finer mesh.
- Spread compost in 1/4 to 1/2 inch layers after thatching, coring or reseeding.

On trees and shrubs:

- Remove sod from around trees and shrubs as far as branches spread. If this is impractical, remove sod from within a 4 inch diameter circle around plants.
- Use coarse compost or material left after sifting. Remove only the largest branches and rocks.
- Spread 1 to 3 inches of compost.

For erosion control:

- Spread coarse compost, or materials left after sifting, in layers 2 to 4 inches deep over entire planting area or in rings extending to the drip line.
- Mulch exposed slopes or erosion-prone areas with 2 to 4 inches of coarse compost.

Using Compost as a Soil Amendment

Compost can be used to enrich garden beds before planting annuals, ground covers, shrubs and trees.

In flower and vegetable beds and ground covers:

- Dig or till base soil to an 8 to 10 inch depth.
- Mix 1 to 4 inches of compost through the entire depth. In established gardens, mix 1 to 3 inches of compost into the top 6 to 10 inches of soil each year before planting.

On lawns:

- Till base soil to a 6 to 12 inch depth.
- Mix 1 to 2 inches of finely textured compost into the loosened base soil.

Around trees and shrubs:

- Dig or till base soil to a minimum 8 to 10 inch depth throughout planting area, or in areas 2 to 5 times the width of the root ball of individual specimens.
- Mix 1 to 4 inches of compost through the entire depth.
- Do not use compost at the bottom of individual planting holes or to fill the holes. Mulch the surface with wood chips or coarse compost.

Using Compost in Potting Mixes

Sifted compost can be used as part of a potting soil for use in planters, house plants or starting seedlings in flats. Compost is a good component in potting soil: it stores moisture and supplies nutrients not found in sand, bark, peat and pumice.

For starting and growing seedlings in flats or small containers:

- Sift compost through a 1/2 inch mesh.
- Mix 1 part sifted compost, 1 part coarse sand and 1 part Sphagnum peat moss. Add 1/2 cup of lime for each bushel (8 gal.) of mix. Use liquid fertilizers when true leaves emerge.

For growing transplants and plants in larger containers:

- Sift compost through a 1 inch mesh or remove larger particles by hand.
- Mix 1 part compost; 1 part ground-up bark, Perlite or pumice; 1 part coarse sand; and 1 part loamy soil or peat moss. Add 1/2 cup of lime and 1/2 cup of 10-10-10 fertilizer for each bushel (8 gal.) of mix. (An organic fertilizer alternative can be made from 1/2 cup bloodmeal or cottonseed meat, 1 cup of rock phosphate and 1/2 cup of kelp meal.)

Vermicomposting

What Is Vermicomposting?

Vermicomposting is the process of using red wiggler or brown-nosed worms and microorganisms to convert food scraps into dark, earthy smelling, nutrient-rich humus. It is an interesting year-round activity for people at home or in classrooms, and provides a composting option for residents of apartments and homes without large backyards. When properly managed, vermicomposting produces no objectionable odors. It can even be done right in the kitchen!

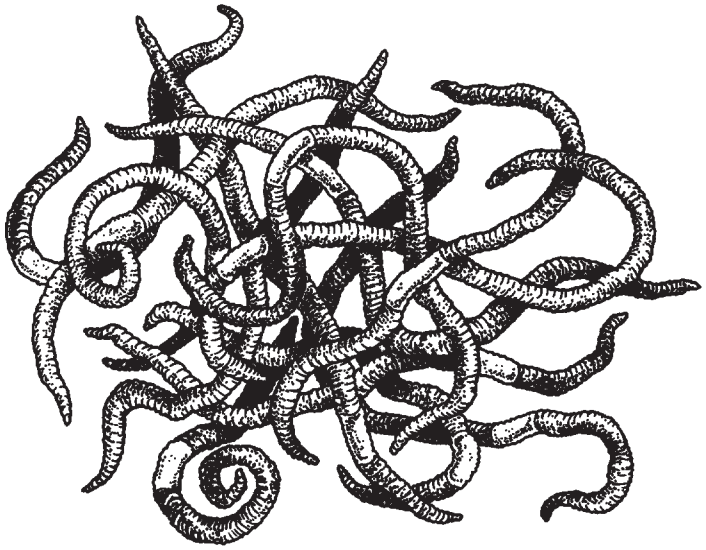
Home worm composting is done in a sturdy container with a lid and air holes. The bin is filled with moist "bedding," such as shredded newspaper, to provide a dark, damp environment that worms desire. Red wiggler or brown-nosed worms (not night crawlers or earth worms) are added and food scraps are buried in the bedding.

The worms do the rest!

Why vermicompost? Because worms consume their own weight in soil and organic matter each day, leaving behind the richest and most productive compost known — castings.

What do worms need for successful vermicomposting?

- Moderate Temperatures – The most rapid feeding and conversion of waste will occur at temperatures between 55ºF and 77ºF.
- Moisture – Worms "breathe" through their skin, which must be moist for exchange of air to take place.
- Ventilation – Worms use oxygen just as we do. It is important that you let air circulate around the bin.
- Darkness – Too much light will disturb the worms, keeping them from concentrating on eating and reproducing.



red wigglers

How to Compost with Worms

1. Purchase a plastic bin approximately 16 x 20 x 8 inches.
2. Drill ventilation holes around the perimeter of the bin about 3 inches from the top.
3. Prepare bedding for the worms.
   a. Place one or two handfuls of soil in the bottom of the bin.
   b. Cut or shred enough newspaper into strips to fill the bin 2/3 full.
   c. Spritz the newspaper with water until every piece is damp.
4. Add about a pound of worms.
5. Add 1 or 2 inches of dry newspaper bedding on top of the moist bedding.
6. Add one pound of food scraps every 5 to 7 days.* Mix the dry bedding (which is now moist) into the other bedding, push aside the bedding to form a pocket large enough to contain the food, deposit the food and recover it with the moist bedding.
7. Add 1 to 2 inches of dry newspaper bedding on top of the moist bedding.

*NOTE: Start out with only 1/2 pound of food scraps for the first 2 to 4 weeks while the worms get used to their new home.

What Do Worms Eat?

potato peels
grapefruit and orange peels
outer leaves of lettuce and cabbage
celery ends
coffee grounds and filters
tea bags
egg shells
banana peels
apple peels and cores
plate scrapings and leftovers
oak leaves
the bedding in the bin

egg shell

banana peel

apple

What Do Worms NOT Eat?

meat
bones
dairy products
oils/sauces

tea bag

Harvesting Worms and Castings

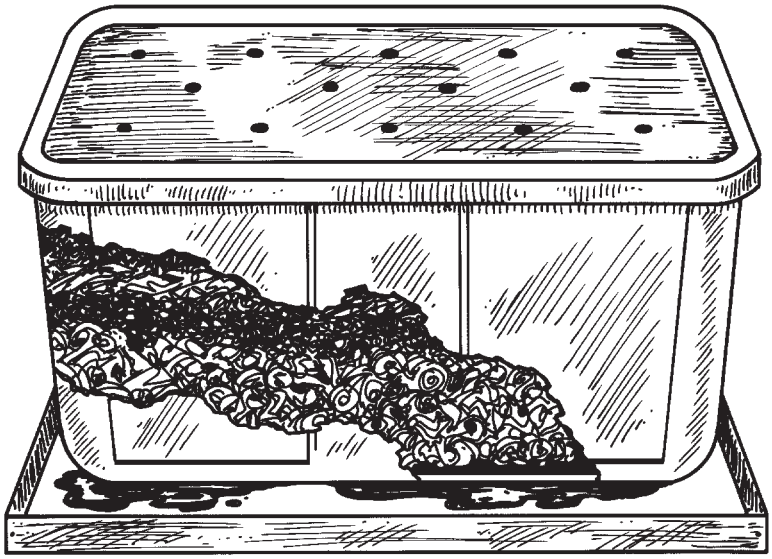
Worm bins produce rich compost for the garden and worms for composting. Worm compost is also called "castings." There are several methods for harvesting worms and compost from the bin. Which method is preferred depends on whether the desired product is worms, compost or both.

Worms move away from light and from temperature and moisture extremes. They also move to a source of fresh food. Combine these factors with harvesting objectives to select a preferred harvesting method.

Harvesting compost for the garden is the easiest management method. In 6 to 9 months, the worms will have created enough compost for you to harvest. Leaving worms in a bin full of castings too long will inhibit their activity.

Harvesting by Migration

The simplest way to harvest worm castings for garden use is to move the castings to one side of the bin and put fresh bedding in the empty side. For the next month only add food scraps to the newly bedded side of the bin. The worms will migrate over to the fresh food and bedding. When the old bedding and food scraps are composted, remove and replace with fresh bedding.



Harvesting by Dumping and Sorting

To harvest larger quantities of worms, spread a plastic sheet on the ground or a table. Place a desk lamp over the area where you will be working. Dump the entire contents of the bin onto the plastic sheet and form about nine cone-shaped piles. Since worms do not like bright light, they will quickly move away from it, into the middle of the piles. Gently remove the outer surface of each pile — as you do this, the worms will retreat further into the pile. Eventually, the worms will have amassed at the bottom of each pile. Then, just start a new bin with fresh bedding.

Other Harvesting Methods

Maintaining two worm bins allows you to simply stop feeding one and let the worms finish composting its contents. When the compost is done, it can be harvested for use in the garden, worms and all.

Harvesting worms for starting new worms bins is simple. Place some cornmeal or cereal in a shallow trench in the bedding. Cover the trench with a piece of moist paper or cardboard. Return the next day to find a mass of worms which can be easily scooped out.

Since worms are sexually mature three weeks after hatching, you're going to have lots of worms. What do you do with all those extra worms?

- Make an extra bin.
- Make a larger bin.
- Put them in your garden – worms are nature's roto-tillers.
- Assist a friend in starting to vermicompost.

Putting Worm Castings to Use

Worm castings are very nutrient-rich, so use them sparingly. Although worm castings can be used in the same ways as yard trimmings compost, they are so rich that they should be used in smaller amounts.

Potting mixes – Worm castings make an excellent addition to a homemade or commercial potting mix. Mix 1 part of worm castings with 3 parts of a favorite potting mix. Equal amounts of worm castings, peat moss, perlite and sand or garden soil also make a good potting mix.

Transplants – When transplanting plants into the garden from potted plants or flats, work a handful or more of worm compost into the hole before planting.

Amending planting beds – Spread 1/2 to 1 inch of castings and incorporate into the soil with a fork or spade.

Side dressing for house plants or garden plants – Spread 1/2 to 1 inch of castings around established plants and scratch into the soil with a trowel.

CAUTION

Worm castings are not recommended for seed beds or flats. It is not recommended to use homemade worm castings for starting seeds. Since worm bins do not get hot, it is common for the seeds of tomatoes and other plants to survive the composting process and resprout. In addition, when worm castings are used in outdoor seed beds, birds may disturb the sprouting seeds while hunting for worms and worm eggs in the castings.

Worm castings are also not recommended for mulching. Worm castings are too nutrient-rich to use as mulch on outdoor plants; they tend to dry out and the nutrients are wasted. Using worm castings to mulch house plants can result in fruit fly problems.

Suggested Reading

Backyard Composting: Your Complete Guide to Recycling Yard Clippings
A how-to guide for residential-scale composting.
96 pages. 1992. $6.95.
Harmonious Technologies
P.O. Box 1865-100
Ojai, CA 93024
(805) 646-8030

Don't Waste Your Wastes — Compost 'em: The Homeowners Guide to Recycling Yard Wastes
by Bert Whitehead
Presents several composting techniques in an easy-to-understand manner.
167 pages. 1991. $10.95.
Sunnyvale Press
P.O. Box 851971
Mesquite, TX 75185-1971
(972) 226-4636
www.baproducts.com/compost.htm

The Garden-Ville Method: Lessons in Nature
by Malcolm Beck
A home-spun approach to gardening and composting.
132 pages. 1993. $6.95.
Garden-Ville Inc.
7561 E. Evans Rd.
San Antonio, TX 78266
(210) 651-6115
www.garden-ville.com

Let It Rot: The Gardener's Guide to Composting
by Stu Campbell
Comprehensive, easy-to-read description of backyard composting methods. 152 pages. 1990. $8.95.
Storey Communications, Inc.
P.O. Box 445
Pownal, VT 05261
(800) 793-9396
www.storey.com

Recycle with Earthworms: The Red Wiggler Connection
by Shelley C. Grossman & Toby Weitzel
This book offers an explanation of both vermicomposting and everything you need to know in order to setup and maintain your own composting system. 100 pages. 1997. $10.00.
Shields Publications
P.O. Box 669
Eagle River, WI 54521
www.wormbooks.com

The Rodale Book of Composting: Easy Methods for Every Gardener
edited by Deborah L. Martin and Grace Gershuny
Easy-to-follow instructions for making and using compost. 287 pages. 1992. $14.95.
Rodale Press
33 E. Minor St.
Emmaus, PA 18098
www.rodalepress.com

The Secret Life of Compost
by Malcolm Beck
A "how-to" and "why" guide to composting.
150 pages. 1997. $19.00.
Acres U.S.A.
P.O. Box 8800
Metairie, LA 70011
www.garden-ville.com

Worms Eat My Garbage, 2nd ed.
by Mary Appelhof
Complete reference on worm composting at home. Concise and entertaining. 162 pages. 1997. $12.95
Flower Press
10332 Shaver Rd.
Kalamazoo, MI 49024
(616) 327-0108
www.wormwoman.com

Worms Eat Our Garbage: Classroom Activities for a Better Environment
by Mary Appelhof, Mary Frances Fenton & Barbara Loss Harris
Curriculum uses over 150 worm-related classroom or home activities to develop problem-solving and critical-thinking skills in children grades 4-8. Activities integrate science, mathematics, language arts, biology, solid waste issues, ecology, and the environment.
232 pages. 1993. $22.95
Flower Press
10332 Shaver Rd.
Kalamazoo, MI 49024
(616) 327-0108
www.wormwoman.com

Sources for Supplies

Cosmo's Red Worms
Attn: Paul Cosmides
432 Lawton St.
San Francisco, CA 94122
(415) 759-7874
www.alcasoft.com/cosmos/
Provides Red Wiggler Worms in a food housing called Vermiculture…using rabbit manure…for mail order direct to consumers. Postage Paid. Five days delivery.
Packages:
Package A: 1-1/2 lbs. – $32.75
Package B: 2 lbs. – $39.90
Package C: 3 lbs. – $53.75
The packages contain half red wiggler worms and half bedding (moist vermiculture).
Bulk Prices
$16.00/lb. (worms w/ bedding)

Green Mama's (call first)
5324 Davis Blvd.
North Richland Hills
514-7336
Brown-nosed Worms

Marshall Grain Company (call first)
2224 E. Lancaster Ave.
Fort Worth
536-5636
Red Wiggler Worms
$6.50 for 1/4 lb.

Rabbit Hill Farm
Attn: Jay Mertz
288 Southwest CR 0020
Corsicana, TX 75110
(903) 872-4289
fax: (903) 872-1488
Brown-nosed Worms
$24.00/lb. (includes shipping) mailed Priority Mail

Crow Worm Farm
4808 FM 2135
Cleburne
(817) 558-4221
Red Wiggler Worms

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