

Composting

Composting is controlling the natural decay of organic matter by providing the right conditions for composting critters to convert yard trimmings into a product that can be returned to your landscape and garden. Tiny organisms (mainly bacteria, fungi and protozoa) break down garden and landscape trimmings in a moist, aerobic (oxygen-demanding) environment. The final product is a dark, crumbly form of decomposed organic matter.



Dark and crumbly decomposed organic matter from beneath mesh compost bin.
Tufts University

Compost improves your soil. When added to soil, compost breaks up heavy clay soils, helps sandy soils retain water and nutrients, and releases essential nutrients. Compost also contains beneficial microscopic organisms that build up the soil and make nutrients available to plants. Improving your soil is the first step towards growing healthy plants. More information is available by requesting *Recycling Yard Trimmings: Home Composting*, IL 48.

What Can I Compost?

Most plant material can be used for compost. Organic trimmings in your landscape, such as fallen leaves, pine needles, grass clippings, flowers and the remains of garden plants make excellent compost. Compost made from grass clippings treated with herbicides and pesticides is not recommended for use in vegetable gardens. Kitchen scraps, such as fruit and vegetable peels and trimmings, crushed eggshells, tea bags, and coffee grounds and filters can also be composted. Woody yard trimmings can be run through a shredder before adding to the compost pile. Sawdust may be added in moderate amounts if additional nitrogen is applied. Add a pound of actual nitrogen per 100 pounds of dry sawdust.

What Materials Should I Avoid Adding to my Compost Pile?

Organic materials that should not be added to your compost pile include meat, bones and fatty foods (such as cheese, salad dressing and leftover cooking oil). Do not add pet or human wastes to a compost pile.

Weeds that have not gone to seed can be added to the compost pile. Weeds with large storage roots like nutsedge, Florida betony or greenbriar should be left out and dried in the sun before composting to reduce their chances of survival.

The high levels of heat produced in the center of the compost pile can kill many pests, such as weeds with seeds and diseased or insect-infested plants. However, it is very difficult to mix the contents thoroughly enough to bring all the wastes to the center, so some disease organisms may be returned to the garden with the compost.

"Essentials" of Composting

Organic materials for composting all contain nutrients that provide energy and growth for microorganisms. These organic materials each have their own ratio of carbon to nitrogen (C:N) in their tissues (Table 1). These C:N ratios are important because the tiny decomposers need about 1 part of nitrogen for every 30 parts of carbon in the organic material. If the ratio is greater than 30:1, nitrogen will be lacking and materials will decompose more slowly.

Table 1. Average Carbon to Nitrogen Ratios for Organic Materials

	Organic Material	Average Carbon to Nitrogen Ratio
Greens	Pig manure	5-7:1
	Coffee grounds	20:1
	Vegetable scrapes	12-20:1
	Grass clippings	12-25:1
	Cow manure	20:1
	Poultry manure (fresh)	10:1
	Horse manure	25:1
	Alfalfa/sweet clover hay	12:1
	Poultry manure w/litter	13-18:1
	Horse manure w/litter	30-60:1
Browns	Leaves	30-80:1
	Cornstalks	60:1
	Straw	40-100:1
	Bark	100-130:1
	Paper	150-200:1
	Sawdust	400:1
	Wood chips	800:1

Leaves, straw and sawdust are high in carbon, while grass clippings, manure and vegetable scraps are higher in nitrogen. It helps to think of these materials as greens and browns. Greens, such as grass clippings, are high in nitrogen. Browns, such as leaves or sawdust, contain high amounts of carbon.

Be aware that anything organic will decay (as long as it is organic, the critters will eat it); however, it may take a long time to make compost when the C:N ratio is too high. For example, a pile made solely of sawdust will take years to decay. Adding

more greens, such as grass clippings or vegetable scraps, will speed up decay and produce compost in less time. Experiment to find the right combination of materials for your compost pile.

Surface Area & Size of the Compost Pile: The more surface area the microorganisms have to work on, the faster the materials will decompose. You can increase the surface area of your yard trimmings by chopping them up with a shovel or running them through a shredding machine or lawnmower.

A large compost pile will insulate itself and hold in the heat created by the tiny organisms. Piles smaller than 3 feet x 3 feet x 3 feet have trouble holding this heat, while piles larger than 5 feet x 5 feet x 5 feet prevent enough air from reaching the center of the pile and the microbes. In addition, turning a large pile is a chore. If your pile is large, you will have to turn it more often. If the pile is small, you will get a good batch of compost during warm months.

Moisture & Aeration: The microbes in your compost pile need a certain amount of water and air to survive. Microbes function best when the materials are about as moist as a wrung-out sponge and are provided with plenty of air. Too much moisture will force out the air and suffocate the microorganisms. Too little moisture will slow down decay. Whenever you add water, be sure to mix the material to distribute the moisture evenly.

Turning the materials in your pile supplies oxygen to the composting critters. A lack of oxygen in a compost pile can lead to an odor problem due to the production of ammonia and methane gases. Decomposition without oxygen also causes the production of chemical compounds that are toxic to plants. Organic matter that has been allowed to decompose without oxygen (for example, "composting" in closed garbage bags) should be exposed to air for several days to complete the composting process and to destroy any plant-toxic compounds.

Temperature & Time: As a result of the decomposition process, the interior temperature of the pile should peak between 90 and 140 °F or higher. A hotbed (or long-stemmed) thermometer can be used to check the interior temperature of the pile at least 12 inches from the surface. The intensity of the process depends on the amount of nitrogen in the materials. The time required to

produce compost depends on the kind and coarseness of the materials, volume of the pile, and availability of moisture and air. It can take a month, a year or longer.

Some Composting Methods

"Fast" Compost Recipe: This method can produce compost in a couple of months or less but is labor-intensive and requires frequent turning. Start your pile with a layer of browns, and then add a layer of greens. If the greens are not fresh, sprinkle in some blood meal or cottonseed meal, poultry manure, or other nitrogen source. Mix well and add water if necessary to moisten. Adding a layer of garden soil, old compost or manure to each brown-green layer will introduce more critters to speed up the process.

Continue adding and mixing layers of greens and browns until you either fill the bin or run out of materials. Slant the top of the pile to the center to catch rainfall. You may want to cover the pile with a plastic covering or tarp to regulate the amount of moisture entering your pile. The cover should not rest on the pile because it may cut off oxygen.

Periodically, check the moisture content of your pile. The compost should feel damp. Check the interior temperature of your pile and when the temperature reaches 140 °F or begins to fall, it is time to turn the pile. You will need to turn your pile every three to five days. Once your turning causes no rise in temperature, and the material appears dark and crumbly, your compost is ready.

"Slow" Compost Recipe: Slow composting is the least labor-and time-consuming way to compost; it is ideal for people who do not have a large amount of yard trimmings to compost all at once. This method can take from six months to two years or longer to produce compost, so be patient.

The ingredients are the same as those for a "fast" compost. Add greens and browns to your pile whenever they become available. Turn the pile occasionally to mix the materials together to prevent the materials from clumping together and to avoid anaerobic decomposition. You will know that your materials are decaying without oxygen by the foul odor: a telltale sign for you to turn the pile. Look for ready-to-use compost near the bottom of the pile.

Compost Structure

Composting structures can be made from a wide variety of materials or purchased through local garden centers or mail order catalogues. There are no set rules when building a compost bin. The sides should be loose enough to provide some air movement and one side should open for easy turning and compost removal. If you choose not to use a container, cover the heap with a layer of yard trimmings or soil to prevent moisture loss.



Composting bin and tool shed

Karen Russ, ©2007 HGIC, Clemson Extension

Circular Bins: A circular bin is very useful for composting larger quantities of organic materials, and can be easily made from a length of closely spaced woven wire fencing held together with chain snaps. The bin should be 3 to 5 feet in diameter and at least 4 feet high. It is easiest to turn the composting material by simply unsnapping the wire, moving the cylinder a few feet, and turning the compost back into it.

Simple bins can be made of old wooden pallets stood on their ends in a square or open square and nailed or tied together. A chicken wire cage supported by three or four wooden stakes will also work well. A standard-sized garbage can with eight or more slots in the sides of the can for ventilation and five in the bottom for drainage can also be used.

Three-Chambered Unit: A three-chambered bin works on the assembly line principle, and is an efficient structure for "fast" composting. Three batches of compost are in various stages of decomposition at all times. The composting process is started in the first bin for three to five days. This

material is then turned into the middle bin for another four to seven days and a new batch is started in the first bin. Next, the middle bin is turned into the third bin as nearly finished compost. Each bin should be at least three to five feet in each dimension and should be made with rot-resistant wood (redwood) or wood treated with an environmentally safe preservative.



Three-chambered composting bin
Karen Russ, ©2007 HGIC, Clemson Extension

Barrel or Drum: The barrel or drum composter is an excellent choice if you have limited space in your yard. A barrel of at least 55-gallon capacity with a secure lid is required. To provide good air circulation and drainage, drill six to nine rows of half-inch holes over the length of the barrel, and place the barrel upright on blocks. Fill the barrel three-quarters full with organic wastes and add water to lightly moisten. Mix the compost every few days by turning the drum on its side and rolling

it around the yard. The compost should be ready in two to four months.



Compost Tumbler with leaves.
Karen Russ, ©2007 HGIC, Clemson Extension

Using Compost

Think of compost as a soil amendment and not as a fertilizer, since the nutrient level of compost is low and released over time. Mix compost with soil to enrich the flower and vegetable garden. It can be used to improve the soil around trees and shrubs, as a top-dressing for lawns, or as a mulch. Screen compost by separating the larger particles and any uncomposted materials from the finer ones and add it to the potting mix for houseplants. No more than one-quarter to one-third by volume of the potting mix should be compost. Soaking compost in a burlap or cheesecloth sack steeped in water can make compost "tea." The weak nutrient solution can be given to young plants.

Table 2. Troubleshooting Guide for Efficient Composting.

Symptoms	Problems	Solutions
Rotten odor	Not enough air; pile too wet	Turn pile; add coarse, dry materials (straw, corn stalks, etc.)
Ammonia odor	Too many greens (excessive nitrogen/lack of carbon)	Add browns (straw, paper or sawdust)
Low pile temperature	Too small; not enough air or moisture; few greens; or cold weather	Make pile larger; add water while turning the pile; mix in nitrogen sources (grass clippings, manure, or a synthetic fertilizer, such as 10-10-10); or insulate the pile with a layer of straw or plastic
High pile temperature	Too large; not enough air	Reduce pile size; turn pile
Pests, such as rats, raccoons or insects	Meat or fatty food scraps in pile	Remove meat and fatty foods from pile; cover with a layer of soil or sawdust; build an animal-proof compost bin.

Excerpted from *Recycling Yard Trimmings: Home Composting*, IL 48, Revised 1997.

Images added 06/13. Prepared by Bob Polomski, Extension Consumer Horticulturist, and Nancy Doubrava, HGIC Information Specialist, Clemson University. (New 06/99.)

This information is supplied with the understanding that no discrimination is intended and no endorsement by the Clemson University Cooperative Extension Service is implied. All recommendations are for South Carolina conditions and may not apply to other areas. Use pesticides only according to the directions on the label. All recommendations for pesticide use are for South Carolina only and were legal at the time of publication, but the status of registration and use patterns are subject to change by action of state and federal regulatory agencies. Follow all directions, precautions and restrictions that are listed.