

# Composting

**Where can you find ‘gardener’s gold’ and ‘recycled sunlight’?** In the compost pile, of course! In nature, organic matter is continually being broken down and recycled; a well-built compost pile simply accelerates nature’s cycle. The terms ‘organic matter’ and ‘humus’ are sometimes used interchangeably, but in this case, organic matter is the raw material you put into the compost pile, and humus is the main ingredient in the finished product.

## Why make compost?

Compost benefits the garden in many ways. It improves the physical condition of both sandy and clayey soils by supporting the formation of soil granules or aggregates. A granular soil not only holds more water but also gives more spaces for air to move between granules. Water and air are vital to soil organisms and plant roots. A granular soil also holds together better and is less likely to be eroded by wind and water.

Compost is a great source of nutrients for plants. If a good variety of raw materials went into the compost pile, then a well-balanced mix of nutrients should be stored in the finished product. What’s more, compost releases these nutrients throughout the growing season. In the spring, when plant demand is low, nutrients are released slowly. As the soil warms up, plant growth starts to accelerate, microorganisms get more active, and nutrients are released more quickly. Adding compost every year builds up nutrient levels so that eventually very little or no additional fertilizer is necessary. That saves both time and money.

Compost is full of beneficial microorganisms. Some of these microorganisms help fight soil-borne plant diseases; others help enliven the soil and boost nutrient cycling.



*High quality compost adds nutrients and improves the soil's physical and biological properties.*  
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## Life in the compost pile

The well managed compost pile is a happening place! All sorts of organisms are busy breaking down or converting materials into simpler forms. Larger organisms such as worms, millipedes, beetles, and ants, chew and grind away at the raw materials. Microscopic organisms, mainly bacteria but also fungi, actinomycetes and protozoa, digest and decompose.



*A worm at work in the compost pile. What you can't see are the millions of microscopic organisms also at work turning raw materials into humus.* © Desiree Jans, Dalhousie.

Both biological and chemical processes are at work. Microorganisms get their energy by oxidizing materials, especially carbon. This biological process causes the compost pile to heat up. The more easily oxidized materials are the first to go which explains why the pile heats up quickly at the start. As biological activity slows down, the pile begins to cool.

## How to make compost

Combine the right mix of ingredients, keep them moist and aerated, and the compost organisms will do the rest. What is the right mix of ingredients? Compost organisms need carbohydrates (carbon) and proteins (nitrogen) in the right proportions. A ratio of around 25 parts carbon to 1 part nitrogen is ideal. Materials high in carbon are usually brown or yellow, dry and fluffy; think dry leaves, straw, hay, and



sawdust. Materials high in nitrogen tend to be green and moist, dense, or sticky; grass clippings, vegetable wastes, and fresh manure. The smaller the bits that go into the pile, the faster they will decompose. Shred or chop large items such as corn stalks or woody cabbage stems and run the lawnmower over fallen leaves. (See Table 1 for the C:N ratio and degradability of various materials).

**TABLE 1. CARBON-TO-NITROGEN RATIOS AND DEGRADABILITY OF ORGANIC MATERIALS**

| Material                | C:N Ratio | Degradability |
|-------------------------|-----------|---------------|
| Vegetable wastes        | 12        | good          |
| Coffee grounds          | 20        | medium        |
| Grass clippings         | 20        | good          |
| Dry leaves              | 50        | medium        |
| Sawdust                 | 100-500   | poor          |
| Poultry manure          | 10        | good          |
| Poultry manure + litter | 15        | medium        |
| Cattle manure           | 20        | good          |
| Hog manure              | 5-7       | good          |
| Horse manure            | 25        | good          |
| Straw                   | 50-100    | medium        |
| Alfalfa hay             | 13        | medium        |

The compost microorganisms need water and air. The pile should be damp but not soggy. If you can squeeze more than a couple of drops out of a handful of it, it's too wet. The 'green and moist' material in the pile should supply most of the needed moisture but you can also sprinkle water on the brown layers as you build your pile so that everything is evenly moist. If hot weather dries out the pile, you may have to spray it with water or cover it with some loose straw to protect from drying sun and wind.

Making sure the microorganisms have enough air does not necessarily mean that you have to turn the compost pile, although turning does speed up the process. Good aeration starts with a well-drained site; even a bit of standing water will wick up into the pile and could cause problems. Use coarse materials at the bottom of the pile so that air can pass through. Also think about air passages as you build your pile; for example, straw improves air flow while grass clippings tend to mat together when wet.

The final consideration is heat. Composting works best if the temperature inside the pile gets up to 50-60°C for at least 10 days. This not only boosts the breakdown of organic materials but also kills disease organisms and weed seeds. Things should heat up with the right mix of ingredients, moisture and air but size also matters. The pile should be at least 1m x 1m x 1m. If the pile is too small, heat will escape before it can get to the right temperature. If it is too big, it gets hard to manage and the interior may become short of air. (You can build a long pile, say 1 m tall x 1 m wide and 5 m long, without these problems).



*Barrel composters allow for quick and easy turning, and make good compost management less of a chore. © Lana Bos, Dalhousie.*

If you plan to make compost regularly, it will be helpful to have some form of compost bins. You can construct two bins out of planks or concrete blocks. Make the bins about 1.2 m (4') high, 1.2 m (4') wide, as long as desired, and open at one end for easy access. Leave spaces between blocks or planks for aeration.

A simple, portable, compost bin can be made with three or four sturdy used pallets that are simply stood on their ends in a square or open square and lashed or otherwise held together. This type of bin can be disassembled for easy turning and emptying, and then reassembled around the new pile. A chicken wire cage supported by three or four wooden stakes will also work satisfactorily, but is somewhat less sturdy.

There are also ready-made and kit composters available, including slat-sided cylinders into which refuse is added from above and compost removed at ground level. Rotating barrels for easy turning are also available; gardeners who have physical disabilities may find either of these types easier to deal with than the standard compost bin.



*This top-loading, bottom-unloading composter is inexpensive, but the construction is not as durable that of more expensive models.*  
© R. Campbell, Dalhousie.



*A compost system lets you turn kitchen scraps and garden wastes into a valuable resource.*  
© Lana Bos, Dalhousie .

### Steps to quick (hot) compost

The advantages of hot composting are that the compost will be ready quickly, and high temperatures will kill weed seeds and disease causing organisms. The main disadvantage is that it requires labour to turn the pile.

1. Gather raw materials to make a pile that will be at least 1 m x 1 m x 1 m (3.3'). Shred and chop materials as finely as possible. Avoid oils, meat scraps, animal feces, and pesticide-treated plant materials. Store ingredients in piles or bins until ready to start.
2. Designate a spot near the garden for composting. You can make compost or just make a pile.
3. Use a garden fork to stack layer upon layer until you have a large enough pile. Alternate brown dry materials (high in carbon) with green moist materials (high in nitrogen). Try to have about equal volumes of each type of material. Sprinkle several shovelfuls of garden soil onto alternate layers to inoculate the pile with decomposer organisms.
4. Keep the pile moist. As you build the pile, sprinkle the layers with water if the materials are very dry. During composting, make sure the pile stays moist but not soggy.
5. Mix and aerate. The best method is to turn your pile every two days. Use a garden fork to invert the pile next to the original pile. Make sure materials on the outside end up in the middle. A slightly less effective method is to poke and fluff the pile with a garden fork. As long as the inside of the pile feels hot to the touch, active decomposition is taking place.

Compost should be ready in 2 to 6 weeks. It's finished when the temperature stabilizes and you can no longer recognize the raw materials you started with. It will smell earthy and is dark brown.



### Steps to slow (cool) compost

The main advantages to cool composting are that it involves less labor, and you can add materials a little at a time as they accumulate. The disadvantages are that it takes 6 months to 2 years to produce finished compost, and it doesn't kill weed seeds or pathogens.

1. Lay down a base of coarse airy materials on a well-drained site.
2. Add ingredients as you accumulate them. To keep a good mix of carbon and nitrogen materials, keep a supply of straw on hand to layer with kitchen scraps or grass clippings. Add a sprinkling of soil once in a while and keep everything moist.
3. When the pile has reached 1 m x 1 m x 1 m (3.3'), cover it with a layer of straw and let it rest for at least 6 months. Check to see how well decomposed the raw materials are. You may have to wait up to 2 years depending on materials, aeration, and climate. Before using, screen out large undecomposed pieces.



*Slow composting is low labor, but takes extra time. This material is in its second season!*  
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### How to use compost

Compost can be used in many ways without having to worry about harming plants or the environment. If you are starting a new vegetable garden, spread a layer of compost 2.5 cm (1") to 5 cm (2") thick over the surface of the soil and mix it in. After that, annual applications of 1 (0.4') to 2 cm (0.8') (depending on soil conditions) should suffice. In either case, it's best to apply compost 2 to 4 weeks before you begin planting.



*When compost is in abundance, add a layer to the soil surface 2 to 4 weeks before planting.*  
© R. Campbell, Dalhousie.

If you are short on compost, concentrate it around plants. For example, when transplanting, mix some compost into the hole before setting in the seedling. You can also side-dress plants. This is best done midsummer by applying a thin layer (0.5 cm, 0.2') of compost on the soil next to plants. Try brewing some compost tea; a liquid boost for plants that can be given every couple of weeks (see Activity 2 below).

If you have lots of compost, use it as mulch. A thick layer on top of the soil will suppress weeds, conserve moisture, feed plants, and help protect them from disease (see 'Mulching' in this guide).

**If you are having trouble with your compost pile (hot or cold), refer to the handy troubleshooting guide in Table 2.**



| <b>TABLE 2. TROUBLESHOOTING COMPOST PROBLEMS</b> |  |   |
|--|--|---|
| <b>Symptom</b>                                   | <b>Possible Cause</b>                        | <b>Solution</b>   |
| Unpleasant odor                                  | Too little air                               | Aerate pile   |
|  | Too wet                                      | Add brown dry materials and aerate.   |
|  | Ammonia smell, which means too much nitrogen | Add brown dry materials and aerate.   |
| Pile doesn't heat up                             | Too dry                                      | Poke holes into the pile and water.   |
|  | Needs mixing                                 | Use garden fork to bring materials from the outside to the centre of the pile.                |
| Pile is only warm at the centre                  | Pile is too small                            | Gather more materials and make a bigger pile.   |
|  | Not enough nitrogen                          | Mix in green moist materials.   |
| Lots of undecomposed material                    | Not enough nitrogen and/or too dry           | Add water. Add green moist materials.   |
|  | Layers are too thick                         | Turn pile, breaking up matted material and mix.   |
|  | Pieces too large or difficult to degrade     | Next time, shred or chop large pieces; for now, sift finished compost to remove large pieces. |
| Animals getting into pile                        | Meats and/or dairy products attract them     | Avoid adding these attractants; put loose cover of chicken wire over the pile.                |

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# Activity 1

## **Make a compost pile**

Decide if you will make a hot or cool compost pile. Follow the instructions and make some compost!

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# Activity 2

## **Brew some compost tea**

'Compost tea' stimulates plant growth by adding nutrients and boosting biological activity in the soil. Place 1L of compost in a cloth bag and let it steep in 5 L of water for several days. Use full strength on older vegetable plants (dilute to half-strength for seedlings). Compost tea can be used every 14 days throughout the growing season.

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# Activity 3

## **Experiment with compost in a bag**

Gather the following:

- 1 cup green materials rich in nitrogen such as: fresh lawn clippings, young weeds, fruit and vegetable scraps.
- 2 cups brown materials rich in carbon such as: fallen leaves, straw, sawdust, and shredded newspaper.
- 1 tablespoon of soil

Place the green materials, the brown materials, and the soil into a 1-quart freezer bag. Mist the mixture with water until the browns are moist but not soggy. Seal the bag. Place the bag on a bright windowsill.

Shake or massage the bag each day to mix the ingredients. Every other day, open the bag for about six hours to aerate it and then reseal it. In two to eight weeks, the mix will become compost. Make observations of the changes to the organic materials as they decompose and become familiar with how finished compost looks and smells.

