1986

G86-810 Garden Compost (Revised February 1993)

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G86-810-A
(Revised February 1993)

Garden Compost

This NebGuide discusses the advantages of compost, the compost heap, ingredients, uses and instructions for making compost.

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Compost is a mixture of partially decomposed plant material and other organic wastes. It is used in the garden to amend soil and fertilize plants.

Advantages

The chief advantage of compost is its ability to improve soil structure. Good garden soil is loose and has a high water-holding capacity with adequate drainage. Adding compost to heavy clay soil improves drainage by improving soil structure. Compost also absorbs water and improves the water-holding capacity of sandy soils. To conserve moisture or develop a xeriscape, a landscape requiring little water, it is essential to have soil with good water-retention.

In addition to improving soil structure, decomposing compost will slowly release plant nutrients. Unless applied in very large amounts, compost will not provide all the nitrogen that highly productive crops require. Organic gardeners can supplement generous compost applications with manure to produce good yields without the addition of other fertilizers.

Making and using compost allows the gardener to recycle garden wastes and reduce the burdens of trash disposal.

Composting Materials

Almost all organic materials will decompose, but not all organic materials belong in the compost pile. Yard wastes, such as leaves, grass clippings, straw, and non-woody plant trimmings can be composted. The predominant organic waste in most backyard compost piles is leaves. Grass clippings can be composted; however, with proper lawn management, clippings do not need to be removed from the lawn. If clippings are used for compost, it is advisable to mix them with other yard wastes. Branches, logs, and twigs greater than 1/4 inch in diameter should be put through a shredder/chipper or cut up with a corn knife prior to placement in the compost pile. Kitchen wastes such as vegetable scraps, coffee grounds, and eggshells may also be added. Sawdust may be added in moderate amounts if additional nitrogen is added. Approximately 1 pound of actual nitrogen (6 cups of ammonium nitrate) is required for 100 pounds of dry sawdust.

Certain organic materials should not be used to make compost because they may pose a health hazard or create a nuisance. Do not add pet feces since they may transmit disease. Meat, bones, grease, whole eggs, and dairy products should not be added because they can attract rodents. Most plant disease organisms and weed seeds are destroyed during the composting process when temperatures in the center of the pile reach 140° to 150°F. However, in most compost piles, it is impossible to mix efficiently enough to bring all wastes to the center. Consequently, large amounts of weeds with seeds or diseased plants may create problems (*Table II*).

Carbon-to-Nitrogen Ratios

All living organisms are made of large amounts of carbon (C) combined with smaller amounts of nitrogen (N). The balance of these elements in an organism is called the carbon-to-nitrogen ratio (C:N). This ratio is an important factor determining how easily bacteria can decompose organic waste. The microorganisms in compost use carbon for energy and nitrogen for protein synthesis. The proportion of these two elements used by the bacteria averages about 30 parts carbon to 1 part nitrogen. Given a steady diet at this 30:1 ratio, bacteria can work on organic material very quickly.

Most materials available for composting don't have this ratio. So, to speed up composting, the numbers need to be balanced. For instance, a mixture of one-half brown tree leaves (40:1 ratio) could be used with one-half grass clippings (20:1 ratio) to make a pile with the ideal 30:1 ratio. This will work best on a weight rather than volume basis. Mixing materials of different sizes and textures also helps to provide a well-drained and well-aerated compost pile.

The C:N ratios listed in *Table I* are only guidelines; they are not accurate for every material of that type. For instance, brown grass clippings from a poorly kept lawn will have far less nitrogen content than lush green clippings from a fertilized lawn. Likewise, the leaves from different types of trees vary in the C:N balance.

The best way to become familiar with this balancing is to be specific about it for a while, then relax into an intuitive assessment of what a pile needs. Think in terms of half high carbon and half low carbon material when building a compost pile. While this may not give the optimum C:N balance, it is a useful rule of thumb for those new to composting and not familiar with the materials.

A pile that is too high in carbon will stay cool and sit a long time without breaking down. A pile too high in nitrogen will smell like ammonia gas. In both instances, the decomposition process is working on everything organic. If you have the time to wait and the space to keep these materials, you'll eventually be rewarded with compost.

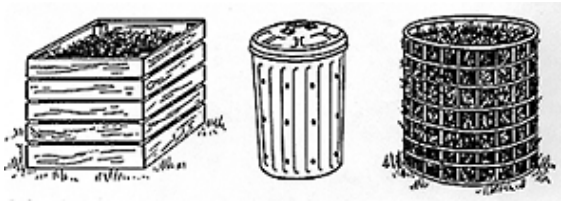
Making a Compost Bin

To save space, hasten decomposition, and keep the yard looking neat, contain the compost pile in some sort of structure. Composting structures can be made from a variety of materials. They can be as simple or complex as desired.

Yard wastes can be composted either in simple holding units, where they will sit undisturbed for slow

decomposition, or in turning bins, which produce finished compost in a month or two.

Holding units are simple containers used to store garden waste in an organized way until these materials break down. A holding unit is the easiest way to compost. It only requires placing wastes into a pile or bin as they are generated.

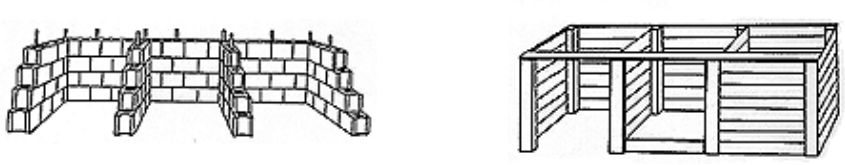


Holding units contain organic waste until it breaks down.

Non-woody materials such as grass clippings, crop wastes, garden weeds, and leaves work best in these systems. Decomposition can take from six months to two years. The process can be hastened by chopping or shredding wastes, mixing dry and wet materials, and maintaining proper moisture.

Since yard and garden wastes will be added continuously, the stage of decomposition will vary from the top to the bottom of each compost pile. Generally, the more finished compost will be found near the bottom of a pile and partially decomposed materials near the top. Once the compost at the bottom of a pile is finished, it can be removed and used.

Turning units are typically a series of bins used for building and turning active compost piles. A turning unit allows wastes to be conveniently mixed for aeration on a regular basis. This speeds composting by providing bacteria with the oxygen they need to break down materials. Turning systems require frequent maintenance and preparation of the wastes to be composted.



Turning units allow convenient mixing for aeration and speed composting.

Composting in these units is most efficiently done in batches. Materials should be stockpiled until there is enough to fill the bin. These bins should be monitored and turned after temperatures have peaked (90-140°F) and begun to fall. This occurs 4-7 days after pile construction. Turn a second time when the temperature peaks again, 4-7 days later. Compost processed this way will be ready in 4-6 weeks.

Location

The compost pile should be located close to where it will be used and yet not offend neighbors. The pile will do best where it is protected from drying winds but in partial sunlight which helps heat the pile.

Building the Compost Pile

A compost pile should be large enough to hold heat and small enough to admit air to its center. As a rule of thumb, the minimum dimensions of a pile should be 3 feet by 3 feet by 3 feet (1 cubic yard) to hold heat. The maximum to allow air to the center of the pile is 5 feet tall by 5 feet wide and as long as you wish.

Microorganisms can only use organic molecules dissolved in water. A moisture content of 40-60 percent

provides adequate water without limiting aeration. The "squeeze" test is an easy way to gauge the moisture content of composting materials. The material should feel damp to the touch, with just a drop or two of liquid being released when the material is tightly squeezed in the hand.

The compost pile can initially be prepared in layers. This will facilitate decomposition by insuring proper mixing.

To build a compost pile, start with a 4-6 inch layer of chopped brush or other coarse material set on top of the soil. This will let air circulate under the base of the pile.

Next, add a 3-4 inch layer of low carbon organic material such as grass clippings. This material should be damp when added to the pile. On top of this, add a 4-6 inch layer of high carbon organic material (leaves or garden waste) which should also be damp.

On top of this, add a 1-inch layer of garden soil or finished compost. This layer will introduce the microorganisms needed to break down the organic matter.

Mix the layers of high carbon organic matter, low carbon organic matter, and soil before adding another layer to the pile. This will ensure a speedy and even composting of the organic matter. Repeat the "layering" process until the composting bin is filled.

Collect organic material.

Blend moist and dry material.

Dampen all organic material.

Turn or aerate the pile periodically.

Maintenance of the Pile

For the passive compost pile, nothing more needs to be done.

For the active compost pile, maintenance will involve turning the pile and adding water to maintain conditions conducive to the composting process. In an active compost pile, the temperature will increase rapidly and soon reach about 110°F. After about a week, the pile should be opened to the air and any compacted material should be loosened. Then the pile should be reconstructed; material previously on the top and sides of the pile should be moved to the center.

After about another week, the pile should be turned again. Each time the material should be turned back to the center of the pile. At each turning, the moisture content should be checked using the squeeze test. Water should be added if necessary.

The compost will be finished when the pile cools off and decreases to about one-third of its original volume. It will be dark, crumbly, and have an earthy odor.

Table I. Carbon/Nitrogen Ratios of Some Common Organic Materials

Material	Ratio
Vegetable wastes	12-20:1

Alfalfa hay	13:1
Cow manure	20:1
Apple pomace	21:1
Leaves	40-80:1
Corn stalks	60:1
Oat straw	74:1
Wheat straw	80:1
Paper	150-200:1
Sawdust	100-500:1
Grass clippings	12-25:1
Coffee grounds	20:1
Bark	100-130:1
Fruit wastes	35:1
Poultry manure (fresh)	10:1
Horse manure	25:1

Table II. Non-Compostable Organic Materials

- Plant with severe disease or insect infestations
- Harmful or succulent weeds
- Grasses that spread by rhizomes
- Dog and cat manure
- Meat or fish leftovers
- Bones
- Butter
- Cheese
- Lard
- Mayonnaise
- Milk
- Peanut butter
- Oils
- Salad dressing
- Sour cream
- Whole eggs
- Grease

Using Compost

Finished compost is dark brown, crumbly, and is earthy-smelling. Small pieces of leaves or other ingredients may be visible. If the compost contains many materials which are not broken down, it is only partly decomposed. Adding partly decomposed compost to the soil can reduce the amount of nitrogen available to plants. The microorganisms will continue to decompose but will use soil nitrogen for their own growth, restricting the nitrogen's availability to plants growing nearby.

Allow partly decomposed compost particles to break down further or separate them out before using compost around growing plants. Or add extra nitrogen (such as in manure or commercial fertilizer) to ensure that growing plants will not suffer from a nitrogen deficiency.

Stable compost can be blended into soil mixes and is suitable for most outdoor planting projects. It is typically mixed with other ingredients such as peat moss, shredded bark, sand, or loamy topsoil when used as an outdoor planting mix. Mixing ratios vary; but 10% compost is considered to be a minimum, 30% optimum, and 50% maximum in planting shrubs and trees.

Stable and cured compost has its greatest value when rototilled directly into the soil. One cubic yard of compost covers 108 square feet at 3 inches, 216 at 2 inches, and 324 at 1 inch. The rule of thumb is to spread compost no more than one-third the depth of the rototiller. A 1-inch layer of compost should be tilled in 3 inches, a 2-inch layer tilled in 6 inches, and a 3-inch layer tilled in 9 inches. Making two or more passes with the tiller helps blend the compost with the topsoil and break up any clumps of material.

Compost Equipment

- stiff-tined fork
- compost thermometer
- garden hose
- containment structure (optional)

File G810 under: HORTICULTURE
E-9, Miscellaneous
Paper version issued February 1993; 3,000 printed.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.