COMPOSTING AT HOME

Barbara J. Bromley, Mercer County Horticulturist 11 (rev)

"Equal weights of green and brown, help the microbes break it down"

For decades we have been putting household, industrial, and municipal wastes into landfills. Common sense tells us that this has to stop, especially in the highly populated Northeast. Most municipalities now have programs that recycle glass, newspaper, office paper, cans, some plastics and woody brush, but this isn't enough.

In some areas up to 75% of household garbage is organic, or carbon-based, material. Over 40% is yard trimmings and food scraps. They often wind up in landfills or are destined for incineration. Environmental consciousness dictates that these materials be recycled by composting. Woody brush goes to composting facilities in some municipalities, but kitchen scraps, grass clippings and many other compostable wastes still wind up in the trash. Some food scraps are destined for a sink food waste disposer.

Composting is nothing new. Nature has been "composting" in field and forest for millennia. Leaves, needles, bark, insects, dead animals, and branches have dropped to the ground and slowly decomposed. This resulting decomposed organic matter, or humus, enriches the soil and releases stored nutrients that feed forest plant life.

COMPOSTING: the process by which plant and animal material (anything that was once living) is decomposed by microorganisms into organic matter. Compost, the material produced, consists largely of decomposed organic matter and can be used to condition and provide nutrients to soil.

COMPOSTING OBJECTIVES

- To make productive use of organic materials that would otherwise go to landfills or incinerators.
- To mimic the process of death and rebuilding that occurs in nature.
- To reduce the mass, volume, and carbon to nitrogen ratio (C: N) of organic wastes.
- To produce a usable product.

REASONS FOR USING COMPOST

A 1"to 3" layer of compost (humus) applied to the garden (and ½" to the lawn) each year will:

1. Save money. It is cheaper than peat moss and other purchased organic soil amendments.

2. Improve soil structure, aeration and fertility.
3. Add varying amounts of essential nutrients (major and trace) to the soil.
4. Act as a buffer and increase the cation exchange capacity (CEC).
5. Provide an energy source for microorganisms and earthworms, and stimulate biological activity in the soil.
6. Act as a mulch to keep down weeds, help moderate soil temperature, help decrease evaporation, reduce soil erosion, and look attractive.
7. Make the soil darker, enabling it to absorb more heat from the sun. This extends the gardening season in both spring and fall.
8. Increase the water-holding capacity of the soil and act as a drought protection. (100 lb. of humus holds 195 lb. of water.)

FACTORS AFFECTING DECOMPOSITION

TEMPERATURE: The best internal working temperature is between 70°F and 140°F. Decomposition will occur whenever the pile is above freezing, but will occur more slowly the lower the temperature. Appropriate temperatures encourage the activity of thermophyllic, or heat-loving, microorganisms.

OXYGEN: Aerobic decomposition occurs when oxygen levels are at or above 5%. When there is no oxygen, anaerobic decomposition (which produces bad smells and "pickling") starts. Turning the pile with a shovel, spade fork or manure fork increases the oxygen level.

MOISTURE: Water is added to a pile until it is as moist as a wrung-out sponge. For rapid composting a moisture content of 50-60% is best. A cover or tarpaulin over the pile will prevent it from getting too wet during heavy rain or drying too fast during drought or hot weather. Decomposition stops when a pile is too dry or becomes anaerobic if too wet.

NUTRIENTS: Nitrogen is necessary for decomposition to occur. If there is not enough "green" or high nitrogen material in the pile, adding a nitrogen (preferably organic) fertilizer or manure will help.

pH: The acidity of the finished compost is nearly neutral (pH of 7), so adding lime is not necessary. Rotted oak leaves and pine needles are only slightly more acidic when fully decomposed.

TIME: The time needed for decomposition to occur ranges from 2 weeks to 2+ years and is dependent on the other necessary factors. (Organic materials buried deep in a landfill may never decompose because of the absence of oxygen).

MICROBES: "Compost accelerators" are usually not needed. There are usually enough microorganisms on leaf surfaces, in the soil on roots of plants, etc. for decomposition to occur.

PARTICLE SIZE: Small pieces break down more rapidly and give a more uniform finished compost.

CARBON TO NITROGEN RATIO: The ideal C:N ratio for rapid decomposition is about 25:1. This means 25 parts carbon to 1 part of nitrogen. A reasonable range is 20:1 to 40:1.

"BROWNS" (carbon-rich, dry, woody)	**"GREENS"** (nitrogen-rich, moist, succulent)
Wood chips and prunings 400-700:1	Fresh grass clippings 12-20:1
Sawdust 400:1	Poultry manure 15:1

Cornstalks 60:1	Coffee grounds 20:1
Pine needles 80:1	Fruit and vegetable scraps 12-35:1
Paper 170:1	Horse manure 25:1

COMPOSTING PROCESS

Producing compost is easy. Organic materials (see list of compostable materials) are piled together and allowed to decompose over time. The digestion of plant and animal material by soil microorganisms accomplishes this decomposition. The heat in a compost pile is the result of oxidation or "biological burning." The compost is ready to use when everything in the pile is brown and crumbly, individual components are no longer identifiable and the pile's internal temperature drops. The original organic materials have decomposed into a relatively stable material called **humus**.

If organic materials such as leaves are just dumped in a pile and left to decay, decomposition generally takes place slowly over a couple of years during the growing season. (In winter, freezing temperatures and low volume of compostable material cause composting to stop until the weather warms again.) Home gardeners who practice composting are usually looking for a usable product more quickly. The rate at which organic matter will break down can be accelerated by:

- chopping or shredding materials into small pieces
- mixing equal weights (not volumes) of green (high nitrogen) and brown (high carbon) materials
- turning the pile regularly
- keeping the pile moist, but not wet
- maintaining a volume of a least one cubic yard.

It is not necessary to create layers of different materials in the pile or bin. Large quantities of high nitrogen or green materials, such as fresh grass clippings, should be blended with high carbon or brown materials to prevent overheating and the bad smells of anaerobic decomposition.

COMPOSTING STRUCTURES

Fancy or expensive bins are not necessary for successful composting. Small amounts of organic matter can be spread over a garden or other soil area and turned into the soil in a process called "sheet composting." Small quantities of kitchen or yard waste can also be buried 12 inches deep at intervals throughout the garden. With care, apartment and condominium dwellers with no yard space can compost in plastic garbage bags, trash cans or with worm boxes (vermicomposting.) It is also possible to create a pile of materials without any framing at all, the traditional compost "pile".

For neatness and efficiency a bin or container may be desired. Good working sizes for bins range from 3'x3'x3' to 5'x5'x5'. When a bin is filled, the contents will heat up to 140°F or higher, accelerating the decomposition process and possibly destroying disease organisms and weed seeds. A smaller pile, or just a few materials added to a bin at a time, called "cold composting," will not heat up as efficiently. A pile taller than 5 or 6 feet may weigh itself down and drive out oxygen creating an anaerobic condition. Then composting will stop or, if there is too much moisture present, become putrescent (smelly.)
Considerations when deciding which container/method to use are:

- Personal taste
- Labor involved
- Expense of materials
- Availability of materials
- Space available

Composting units can be above or below ground, permanent or temporary, framed or unframed, rectangular or cylindrical, beautiful or "functional". They can be individual bins, called holding bins, where materials are added and held until they decompose, which is a relatively slow process. They can be multiple bins, called turning bins, where materials that have partially decomposed are shoveled or turned into an adjacent bin. Fresh material is now placed in the vacated bin. Because turning tends to accelerate decomposition, this is a faster method. Some possibilities for bins and methods include:

Holding Bins:
- Portable wood and wire (cage-type) bin
- Concrete block or brick bin
- Board-constructed bin (New Zealand box)
- Stationary barrel or drum composter
- Pallet bin
- Log or rail bin
- Picket or snow fence enclosure
- Wire fence bin
- Various manufactured bins

Turning Bins:
- Wood and wire 2 or 3-bin unit
- Concrete block 2 or 3-bin unit
- Wooden 2 or 3-bin turning unit
- Rotating barrel composter
- Various manufactured bins

Also:
- Worm box (vermicomposting - indoors or out)
- Open pile
- Something you create

MATERIALS TO COMPOST

Any of the following organic materials will eventually decompose in the presence of oxygen and moisture, but the smaller the particle size, the faster the decomposition. For example, chopped up flower stems decompose more quickly than whole stems.
Vegetable waste, grass clippings, manures, and coffee grounds are relatively high nitrogen. Dried leaves, corncobs, paper, wood chips, sawdust, and straw are relatively high carbon.

straw and hay	powdered milk	bone meal	ground bones
manures	eggshells	cornmeal and flour	leaves
vacuum bag wastes	stale cereal	cottonseed meal	old potting soil/mix
grass clippings	newsprint (b&w)	crop waste	old seed packets
wood shavings	dead insects	kitchen scraps	hair (human, animal)
oatmeal	sawdust (not treated)	paper/cardboard	wood chips
tobacco	pine needles	peanut shells	bird cage "stuff"
seaweed	fish scraps (buried)	seashells (crushed)	corncobs
feathers	dried blood	tea bags	yard waste
rock powders (green-sand, granite dust, rock phosphate)	coffee grounds (with paper filter)	weeds (most, but not all)	natural fibers (cotton, linen, wool)
banana skins	leather	wood ash (small amounts)	watermelon rind
flowers	shredded hardwood		

DO NOT COMPOST:

The following may release unpleasant smells as they rot, spread weeds or diseases, contaminate the compost, or attract rodents or other animals.

meat	grease, fat, oil	most dairy products	human waste
unground bones	used kitty litter	weed seedheads	poultry
non-organics	colored newsprint (if not vegetable dyes)	large woody brush	dog or cat feces
some diseased plants (especially tomato)	treated (preserved) wood or its sawdust	roots or stems of hard to kill or noxious weeds	fish waste (unless buried deeply)

TROUBLESHOOTING

- Pile temperature too hot (over 150°F.): turn the pile.
- Pile too cold: add larger amounts of green materials so the weights of green and brown are approximately equal, check moisture level, wait for spring.
- Pile gives off an ammonia smell: add more high carbon material and turn the pile.
- Decomposition stopped: add a high nitrogen material, turn the pile, check moisture level, cut materials in smaller pieces, wait for warmer weather.
- Pile too wet: mix in an absorbent organic material, such as shredded newspaper, and turn the pile. Cover.
- Infested with flies or other insects: turn the pile, maintain adequate but not excessive moisture, turn in kitchen scraps immediately after adding, put a layer of chopped straw or other dry brown material over the top of the pile.
- Infested with rodents: turn in kitchen scraps immediately after adding or stop adding for a while, use a rodent-proof bin, place hardware cloth or other medium (1/4-1/2 inch) mesh screening under the bin to prevent tunneling. Set traps.

"GRASSCYCLING"

Although grass clippings can be composted, it is infinitely better to leave them on the lawn in the first place. Grasscycling is the natural recycling of grass clippings by leaving them on the lawn when mowing. This easy technique substantially decreases organic matter (and plastic bags) in the waste stream. Grasscycling increases the biological activity near the soil surface and results in a healthier lawn. Clippings decomposing on the lawn return nutrients to the soil, and so reduce the amount of additional fertilizer that needs to be spread by 33% to 50%. This practice does not contribute substantially to thatch buildup. If only 1/3 of the grass blade is removed at each mowing and/or if a mulching blade is on the mower, there should be no unsightly buildup of clipping clumps on the lawn. Up to 4 or 6 inches of fallen leaves can also be mowed into the turf and be allowed to decompose to enrich the soil.