Department of Horticultural Science

Horticulture Information Leaflet 8100

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COMPOSTING FOR HOME GARDENS

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Gardeners have used compost for centuries. When materials such as leaves and grass clippings are composted, a microbial process converts plant wastes to a more usable organic amendment. Grass clippings and leaves can be hauled to municipal or county composting facilities as one means of disposal. However, many homeowners may find it more convenient and economical to compost these materials in their own backyards. In either case, the finished compost can be used as a soil amendment or mulch to improve most soils for gardens, landscape beds, lawn preparation or even as 15% of a potting medium. This leaflet has been written to provide guidelines on how to build and maintain a compost pile.

Decomposition of organic material in the compost pile is dependent on maintaining microbial activity. Any factor which slows or halts microbial growth will also impede the composting process. Efficient decomposition will occur if the following factors are used to fullest advantage.

Aeration: Oxygen is required for microbes to efficiently decompose the organic wastes. Some decomposition will occur in the absence of oxygen (anaerobic conditions); however, the process is slow and foul odors may develop. Because of the odor problem, composting without oxygen is not recommended in a residential setting unless the process is conducted in a fully closed system. Turning the pile once or twice a month will provide the necessary oxygen and significantly hasten the composting process. A pile that is not mixed may take three to four times longer before it can be used. A well mixed compost pile will also reach higher temperatures which will help destroy weed seeds and pathogens.

Moisture: Adequate moisture is essential for microbial activity. A dry compost pile will not decompose efficiently. If rainfall is limited, it will be necessary to water the pile periodically to maintain a steady decomposition rate. Enough water should be added to completely moisten the pile, but overwatering should be avoided. Excess water can lead to anaerobic conditions. Water the pile so that it is damp, but does not remain soggy. The compost will be within the right moisture range if a few drops of water can be squeezed from a handful of material. If no water can be squeezed out, the material is too dry. If water gushes from your hand, it is too wet.

Particle size: The smaller the size of organic wastes, the faster the compost will be ready for use. Smaller particles have much more surface area that can be attacked by microbes. A shredder can be used before putting material in the pile, and is essential if brush or sticks are to be composted. A low cost method of reducing the size of fallen tree leaves is to mow the lawn before raking or run the lawn mower over leaf piles after raking. Raked piles should be checked to insure that they do not contain sticks or rocks which could cause injury during operation of the mower. If the mower has an appropriate bag attachment, the shredded leaves can be collected directly. In addition to speeding up the composting process, shredding will initially reduce the volume of the compost pile.

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Fertilizer and Lime: Microbial activity is affected by the carbon to nitrogen ratio of the organic waste. Because microbes require a certain amount of nitrogen for their own metabolism and growth, a shortage of nitrogen will slow down the composting process considerably. Materials high in carbon relative to nitrogen such as straw or sawdust will decompose very slowly unless nitrogen fertilizer is added. Tree leaves are higher in nitrogen than straw or sawdust but decomposition of leaves would still benefit from an addition of nitrogen fertilizer or components high in nitrogen. Grass clippings are generally high in nitrogen and when mixed properly with leaves will enhance decomposition. Poultry litter, manure or blood meal can be used as organic sources of nitrogen. Otherwise, a fertilizer with a high nitrogen analysis (10-30%) should be used. Other nutrients such as phosphorus and potassium are usually present in adequate amounts for decomposition.

During the initial states of decomposition organic acids are produced, decreasing the pH. In the past, small amounts of lime have been suggested for maintaining and enhancing microbial activity at this time. However, high rates of lime will convert ammonium nitrogen to ammonia gas which will lead to the loss of nitrogen from the pile. Research indicated that lime additions may hasten decomposition; however, the loss of nitrogen from the pile often offsets the benefits of lime. In general, lime is not necessary for degradation of most yard wastes. The pH of finished compost is usually alkaline (pH= 7.1-7.5) without the addition of lime. If large quantities of pine needles, pine bark, or vegetable and fruit wastes are composted, additional lime may be necessary.

Many organic materials are suitable for composting. Yard wastes, such as leaves, grass clippings, straw, and non woody plant trimmings can be composted. Leaves are the dominant organic waste in most backyard compost piles. Grass clippings can be composted; however, with proper lawn management, clippings do not need to be removed from the lawn (see North Carolina Extension Bulletin Carolina Lawns, AG-69). If clippings are used, it is advisable to mix them with other yard wastes, otherwise the grass clippings may compact and restrict airflow. Branches and twigs greater than $^1/_4$ inch in diameter should be put through a shredder/chipper. 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 applied. Approximately 1 lb. of actual nitrogen (6 cups of ammonium nitrate) is required for 100 lbs. of dry sawdust. Wood ashes act as a lime source and if used should only be added in small amounts (no more than 1 cup per bushel or 10 pounds per ton of compost). Ordinary black and white newspaper can be composted; however, the nitrogen content is low and will consequently slow down the rate of decomposition. If paper is composted, it should not be more than 10% of the total weight of the material in the compost pile.

Examples of other organic materials that can be used to add nutrients to the pile include: blood meal, bone meal, livestock manure, non-woody clippings, vegetable and flower garden refuse, hay, straw and lake plants. Livestock manure and poultry litter are nitrogen sources for composting. Approximately 100 pounds of poultry litter will provide 1.8 pounds of nitrogen.

Some materials may pose a health hazard or create a nuisance and therefore should not be used to make compost. Adding human or pet feces cannot be recommended because they may transmit diseases. Meat, bones, grease, whole eggs, and dairy products should not be added because they can attract rodents to the site. Most plant disease organisms and weed seeds are destroyed during the composting process when temperatures in the center of the pile reach 150-160°F.

Although plants that have been treated with herbicides or pesticides should be avoided for composting, small amounts of herbicide-treated plants (e.g., grass clippings) may be mixed in the pile as long as one is careful to allow thorough decomposition. Ideally, clippings from lawns recently treated with herbicides should be left on the lawn to decompose.

Use of plastic garbage bags is perhaps the simplest way to make compost. The bags are easy to handle, and require minimal maintenance. To make compost using this method, 30-40 gallon plastic bags should be alternatively filled with plant wastes, fertilizer and lime. About one tablespoon of a garden fertilizer with a high nitrogen content should be used per bag. Lime (one cup per bag) helps counteract the extra acidity caused by anaerobic composting. After filling, add about a quart of water. Close tightly. Set aside for six months to a year. Bags can be set in a basement or heated garage for better decomposition during winter months. Using garbage bags requires no turning or additional water after closing. The main advantage of composting in garbage bags is that it requires little maintenance; however, because oxygen is limited, the process is slow.

The barrel or drum composter generates compost in a relatively short period of time and provides an easy mechanism for turning **(Figure 1)**. This method requires a barrel of at least 55 gallons with a secure lid. Be sure that the barrel was not used to store toxic chemicals. Drill 6-9

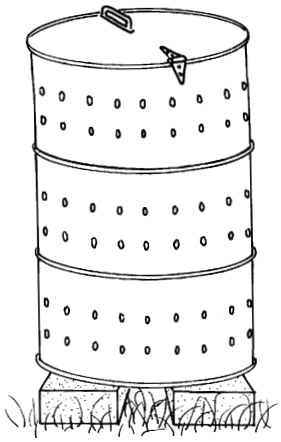

Figure 1

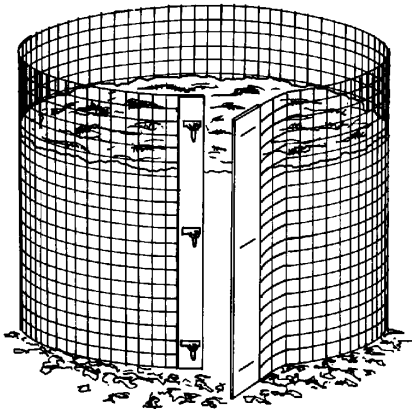

Figure 2

rows of 1/2 inch holes over the length of the barrel to allow for air circulation and drainage of excess moisture. Place the barrel upright on blocks to allow bottom air circulation. Fill the barrel 3/4 full with organic waste material and add about 1/4 cup of high (approximately 30%N) nitrogen containing fertilizer. Apply water until compost is moist but not soggy.

Every few days, turn the drum on its side and roll it around the yard to mix and aerate the compost. The lid can be removed after turning to allow for air penetration. Ideally, the compost should be ready in two to four months. The barrel composter is an excellent choice for the city dweller with a relatively small yard.

For larger quantities of organic waste, bin type structures are the most practical. As an example, a circular bin can be made by using a length of small spaced woven wire fencing and holding it together with chain snaps **(Figure 2)**. The bin should be about three to five feet in diameter and at least four feet high. A stake may be driven in the middle of the bin before adding material to help maintain the shape of the pile and to facilitate adding water. With this design, it is easiest to turn the composting material by simply unsnapping the wire, moving the wire cylinder a few feet, and turning the compost back into it.

A very efficient and durable structure for fast composting is a three-chambered bin **(Figure 3)**. It holds a considerable amount of compost, and allows good air circulation. The three chambered bin works on an assembly line idea, having three batches of compost in varying stages of decomposition. The compost material is started in the first bin and allowed to heat up for three to five days. Next, it is turned into the middle bin for another 4-7 days, while a new batch of material is started in the first bin. Finally, the material in the middle bin is turned into the last bin as finished or nearly finished compost.

To make a three-chambered bin, it is best to use rot resistant wood such as redwood, salt treated wood or wood treated with an environmentally safe preservative or a combination of treated wood and metal posts. Unless the wood is treated or rot resistant, it will decompose within a few years. Each bin should be at least three to five feet in each dimension to contain enough volume to compost properly. Using removable slats in the front offers complete access to the contents for turning.

The compost pile should be located close to where it will be used and where it will not interfere with activities in the yard or offend neighbors. From the aesthetic point of view, it is best to compost in a location screened from view of both your property and neighbor's property. Examples of good locations for the pile include: near the garden or between the garage and house. Do not locate the compost pile near a well or on a slope that drains to surface water such as a stream or a pond. The pile will do best where it is protected from drying winds and in partial sunlight to help heat the pile. The more wind and sun the pile is exposed to, the more water it will need. Locating the pile too close to trees may also create problems as roots may grow into the bottom of the pile and make turning and handling the compost difficult.

Organic wastes, such as leaves, grass, and plant trimmings are put down in a layer eight to ten inches deep. Coarser materials will decompose faster if placed in the bottom layer. This layer should be watered until moist, but not soggy. A nitrogen source should be placed on top of this layer. Use one to two inches of livestock manure, or a nitrogen fertilizer such as ammonium nitrate or ammonium sulfate at a rate of one third of a cup for every twenty five square feet of surface area. If these nitrogen sources are not available, one cup of 10-10-10 fertilizer per 25 square feet of surface area will also suffice. Do not use fertilizer that contains herbicide or pesticide.

About a one inch layer of soil or completed compost can be applied on top of the fertilizer layer. One purpose of adding soil is to ensure that the pile is inoculated with decomposing microbes. The use of soil in a compost pile should be considered optional. In most cases, organic yards wastes such as grass clippings or leaves contain enough microorganisms on the surface to effect decomposition. Studies have shown that there is no advantage in purchasing a compost starter or inoculum. One way to insure that activator microbes are present in the new compost is to mix in some old compost as the pile is prepared.

Most compost piles should initially be prepared in layers. This will facilitate decomposition by insuring proper mixing. Each pile ideally should be about 5 feet high. If only tree leaves are to be composted, layering may not be necessary. Fallen leaves can be added as they are collected. Leaves should be moistened if they are dry and since dead leaves lack adequate nitrogen for rapid decomposition, addition of a high-nitrogen fertilizer (10-30% analysis) should be added to speed up breakdown. Approximately 5 ounces (about 1/2 cup) of 10% nitrogen fertilizer should be added for each 20 gallons of hand compressed leaves.

To prevent odors and hasten decomposition, the pile must be turned occasionally. Turning also exposes seeds, insect larvae, and pathogens to lethal temperatures inside the pile. Odors may arise either from the addition of excessive amounts of wet plant materials like fruits or grass clippings, or from overwatering. A properly mixed and adequately turned compost heap will not have objectionable odors. An actively decomposing pile will reach temperatures of 130-160°F in the middle.

Reasons for the pile not heating up may be due to: too small a pile, not enough nitrogen, lack of oxygen, too much or not enough moisture. The pile should be turned when the temperature in the center begins to cool. This will introduce oxygen and undecomposed material into the center and subsequently regenerate heating. The composting process is essentially complete when mixing no longer produces heat in the pile.

Generally, a well managed compost pile with shredded material under warm conditions will be ready in about 2-4 months. A pile left unattended and material not shredded may take over a year to decompose. Piles prepared in the late fall will not be ready for use the following spring. When the compost is finished, the pile will be about half its original size and have an earthy smell to it.

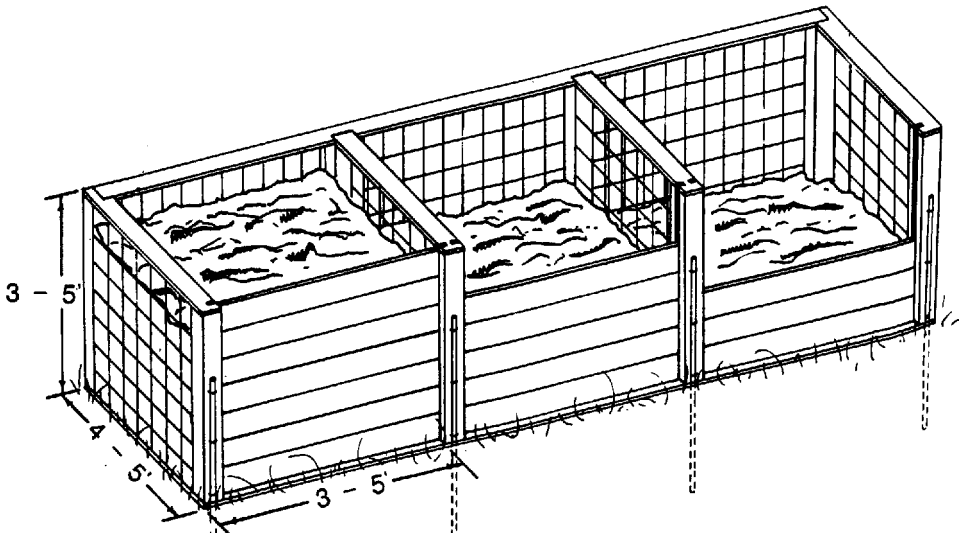

Figure 3