

Solid Waste Management Series

Home Composting

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Why and how to compost at home. Describes the essential "aerobic" ingredients for effectively composting organic materials such as grass clippings, leaves, some kitchen food scraps into a high quality soil conditioner at home.

Home composting is a controlled microbial process that converts organic materials such as grass clippings, shredded branches, leaves, and some kitchen food scraps into a high-quality soil conditioner. Different home composting methods can be classified as aerobic (with air) and anaerobic (without air). The first organisms to inhabit the pile will be aerobic and will persist until oxygen is gone. Turning the pile allows more air to enter and aerobic composting continues. In a pile that has settled, has too much moisture and is not mixed, the aerobic microbes will die

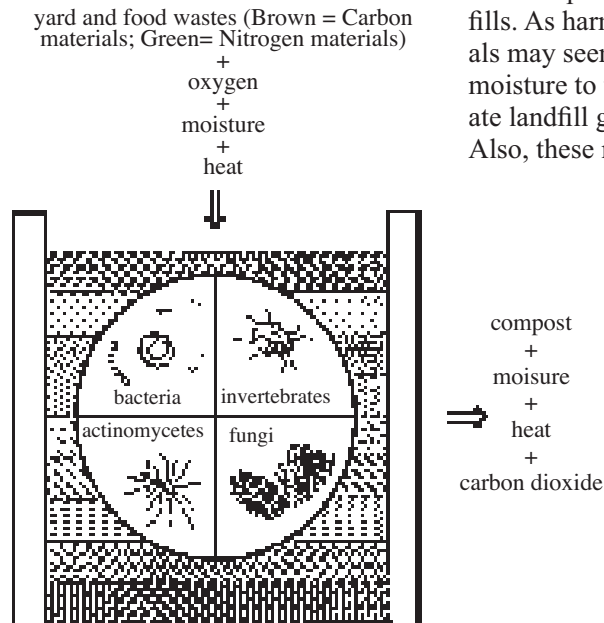


Figure 1. Microbial decomposition converts organic materials to compost (modified from Dickson et al., 1991).

and anaerobic microbes will grow. Anaerobic composting is a slow process that produces foul-smelling gases, yet requires little maintenance once the pile is constructed. Odors are usually controlled by airtight barriers such as layers of soil, plastic sheeting and plastic bins. Aerobic composting, described in this MontGuide, can be odorless and faster, yet requires maintenance time and labor.

Why Compost?

Landscape, garden wastes and kitchen food wastes can account for up to 20 percent of the materials often disposed of at Montana landfills. As harmless as these materials may seem, they add unwanted moisture to the landfill and can create landfill gases that are explosive. Also, these materials take up a lot of

valuable space in a landfill. With fewer landfills in Montana and the difficulty and expense of siting new facilities, it just doesn't make sense to dispose of these beneficial organic materials.

Compost is very similar to organic matter found in high-quality, productive soils and when incorporated into the garden, increases soil quality. It adds

decomposed organic material that slowly breaks down, providing nutrients to plants. Organic matter also holds water in the soil, an important reason for adding compost to sandy soils with rapid drainage. With organic matter added, clayey soils drain better and become less sticky and easier to work. Composting garden and kitchen wastes means smaller demand on shrinking landfill space. With compost providing soil nutrients, fewer fertilizers are required, saving money and energy.

Essentials of Aerobic Composting

Complete and effective composting is much like using a recipe for making a cake. It is a process of using the proper materials and mixing them to achieve that right consistency and balance. Home composting requires a careful balance of materials, organisms, moisture, and oxygen. Microscopic organisms supplied with adequate water, plenty of oxygen and a large food supply of organic materials break down wastes and produce heat (Figure 1). The final product is a smaller volume of dark brown, crumbly compost that has an earthy scent, is loaded with nutrients and has ideal physical properties.

To achieve a satisfying product your recipe for composting should include these essentials for producing rich humus that can be added back to your soil:

1. Organic materials
2. Micro-organisms
3. Volume of materials
4. Particle size of materials
5. Oxygen
6. Heat
7. Moisture

Compost Materials

A wide variety of materials can be composted. Leaves, grass clippings, plant trimmings, straw, many kitchen scraps and manure are excellent starting materials (Table 1). If there is not enough material around the home, you can obtain material from neighbors, restaurants, grocery stores, farms and lumber mills at little or no cost.

Several materials should be avoided because they affect the composting process or the final product (Table 2). Although meat scraps, bones and cheese are composted commercially, they can be slow to degrade and can attract animal pests. Dog and cat manure may contain parasites that escape destruction in the composting process and should be avoided, especially if the compost will be used on vegetable crops. Don't add cooking oil, oily salad residues or grease, as they can coat materials in the pile and slow the degradation process. Carefully consider grass and plant clippings sprayed with herbicides or other chemicals to avoid persistence problems and negative effects on microorganisms (Table 3). Don't use diseased plant material, in order to prevent recurrence of diseases. Some thorny materials like rose clippings may make the compost uncomfortable to work with. Although the interior of a hot compost pile can kill most weed seeds, some seeds are heat resistant or may not get thoroughly heated. Therefore, compost nuisance weeds before their seeds mature, or keep them separate from compost that will be used in the garden. Rhizomatous weeds such as morning glory or quackgrass may also survive a pile that doesn't heat adequately.

Select compostable materials by their carbon/brown and nitrogen/green content. All organic materials consist of a certain amount of total carbon (C)/brown materials and nitrogen (N)/green materials. The microorganisms

Table 1. Common Composting Materials (Organic Gardening, 1990)

Material	Source	Comments
Coffee grounds	Restaurants, offices	Good N source
Corn cobs and stalks	Farms, canneries, garden refuse	Best when ground or used as a mulch texturizer; high in C
Eggshells	Egg farms, restaurants	Calcium and N source
Fish and shellfish scraps	Fish markets, restaurants	High in N and trace minerals, but smelly
Fruit wastes	Canneries, restaurants, market dumps	Banana peels are rich in K
Grass clippings	Lawn mowing, lawn services, neighbors' bags set at curbside	Use only herbicide-free clippings; high in N; decompose rapidly and help heat up compost pile; smelly unless blended with C-rich materials
Hay	Farms	Bulky; high in C; alfalfa highest in N
Leaves	Woods, dumpings in parks or at curbside	Leaf mold (decomposed leaves) an excellent soil texturizer; contain growth inhibitors if not first composted; shred before adding to pile
Manure	Farms, stables, poultry houses, feedlots	From high to low N: pigeon, chicken, duck, horse, rabbit, pig, cow, sheep
Peanut shells	Peanut butter processors	Good soil texturizer with moderate humus potential; slow to breakdown; high in C and K
Pine needles	Woods, evergreen plantings	Highly acid N source; use on acid-loving crops or with neutralizer
Sawdust, shavings, woodchips	Lumberyards, tree surgeons, sawmills, carpentry shops	High in C; exceedingly slow to break down; never add fresh sawdust directly to soil
Stable bedding, sweepings	Stables, farm	Better nutrient balance than manure alone
Vegetable waste	Canneries, restaurants, sorted garbage, food stores, farms	Pea pods very high in N
Weeds	Gardens, fields, pond dredgings	Cut before seeds set, or use in hot compost pile; purslane is high in N
Wheat straw, oat straw	Farms	High in C; slow to break down
Wood ash	Fireplaces, wood stoves, wood furnaces, bonfires	K and P but no N; use sparingly (strongly alkaline); don't use ashes from fires started with charcoal or painted wood

N = nitrogen; P = phosphorus; C = carbon; K = potassium

that feed on the material prefer a carbon to nitrogen (C:N) ratio of approximately 30 to 1 (30:1), by weight. Each material has a different C:N ratio. For example, dried leaves (brown materials) have a high ratio (low in nitrogen), while grass clippings and green leafy material have a lower C:N ratio (high in nitrogen). Generally speaking, green materials and manure have a high nitrogen content, and brown materials have a low nitrogen content (Table 4). Building a home compost pile with the ideal nitrogen level is challenging, but you can usually obtain good results by alternating layers of green and brown materials. By carefully combining materials in the pile, the average C:N ratio can be brought close to 30:1.

In a balanced compost pile, enough nitrogen is added by the green material for microbes to decompose brown materials, and excess nitrogen in the green materials is utilized by microbes and not lost to the atmosphere.

Micro-Organisms

Essential to the rapid decomposition of organic materials are micro-organisms, bacteria, fungi, insects and worms. The proper type and balance of organic materials provides the source of food and protein for micro-organisms to live and reproduce. Bacteria and micro-organisms are already present on dead plant material introduced to the compost pile. However, to boost the organic level of the pile, add a shovel full of rich soil with earthworms. Many backyard composters also claim the most effective composting is done with piles and bins that are in contact with the earth, providing greater access for micro-organisms to enter the compost. "Earth-contact" composting can also enhance the survival rate of organisms should the pile essentials periodically change.

Volume of Materials

The volume size of the organic material is critical. While a larger pile of material will break down faster than a smaller pile, larger piles are also more difficult to manage. To maintain optimum moisture and temperature levels, create a pile size of 3 feet wide by 3 feet deep by 3 feet high (3' x 3' x 3') at a minimum. In locations with widely varying daily temperatures, the

volume could be increased, but for easy turning it should not exceed 4' x 4' x 4'.

Pile Tips

1. The volume of materials in the compost pile should be equal on all sides as the pile is built. Tapered, flat and narrow piles will not heat up or maintain consistent moisture and heat levels for effective composting.

2. In cold climates, insulate the pile sides with hay/straw bales and the top with rigid insulation panels to help create and hold heat in the pile.

Particle Size of Materials

If you shred the materials, they will compost faster. However, coarser materials, although prone to drying, add porosity to the pile and help air come in contact with materials. Conversely, fine sized materials hold moisture, but can get matted down. Small branches can be clipped into pieces two to three inches long, mechanically shredded and cautiously reduced in size with a lawn mower. Heavier branches, larger than a quarter inch in diameter should be chopped, shredded or avoided.

Oxygen/Aeration

Aerobic composting requires introducing oxygen into the pile. This is referred to as "aeration." Aeration is simply turning the materials in the pile or bin with a shovel or fork.

How often you should turn your pile to introduce oxygen is generally a function of the odor of the pile and its temperature. However, while turning the pile to introduce oxygen is essen-

Table 2. Materials that should not be in a compost pile (Dickson et al., 1991)

Bones	Cat manure	Peanut butter
Butter	Dog manure	Salad dressing
Cheese	Fish scraps	Sour cream
Chicken	Mayonnaise	Vegetable oil
Lard	Meat	Milk

Table 3. Persistence of common herbicides in soil (Rosen et al., 1988)

Common Name	Trade Names	Longevity in Soil (Months)
Benefin	Balan, Balfin	4-8
DCPA	Dacthal	4-8
Bensulide	Betasan, Prefar	6-12
Glyphosate	Roundup, Klee-nup	less than 1
2,4-D	(many formulations)	1-2

Table 4. Carbon to nitrogen ratios for selected materials (Dickson et al., 1991)

Material	C:N (by weight)
Materials with high nitrogen values	
Vegetable wastes	12-20:1
Coffee grounds	20:1
Grass clippings	12-25:1
Cow manure	20:1
Horse manure	25:1
Horse manure with litter	30-60:1
Poultry manure (fresh)	10:1
Poultry manure (with litter)	13-18:1
Pig manure	5-7:1
Materials with high carbon values	
Foliage (leaves)	30-80:1
Corn stalks	60:1
Straw	40-100:1
Bark	100-130:1
Paper	150 - 200 :1
Wood chips and sawdust	100-500:1

tial, it is a timing balancing act. Turning the pile too often will cool the pile down and slow decomposition of the material. On the other hand, not turning enough will cause the pile to go anaerobic (composting without oxygen). Anaerobic composting produces foul smelling gases.

Temperature/Heat

The sixth consideration of home composting is controlling the temperature of the compost pile. While decomposition will take place at temperatures between 50°F and 105°F (referred to as “mesophilic” temperatures) the optimum pile temperature is between 110°F and 150°F. It is also within these temperatures that most pathogens will be destroyed (131°F) and weed seeds and fly larvae killed (145°F). To create and maintain this temperature range:

- use a thermometer to monitor temperatures on the inside of the pile (special probe 24”-36” compost thermometers can be purchased. Contact your county Extension office for details)
- for free-standing piles and bins, maintain optimum material size of 3'x3'x3'
- protect the pile from direct wind
- insulate pile on side and top during cold weather
- periodically turn compost materials on the outside of the pile to the inside of the pile

Moisture

Moisture plays an important role in home composting. Moisture provides the mechanism for microbe movement, nutrient transport and chemical reactions. However, like most of the essentials of composting it is critical to monitor the amount of moisture that goes into the pile. Too much moisture will mat down the materials, leach out valuable nutrients and block oxygen to the pile. Too little moisture will dry the pile and will not support microbial growth. As a rule, never dump water onto the compost pile. Sprinkle water gently into the compost materials as the pile is being built and thereafter when it starts to dry out. To gauge the proper moisture level in the pile, sprinkle water in so that the material is moist (like a damp, wrung out sponge) but not soggy.

Building the Pile

The most popular method of backyard home composting is to pile layers of material above ground. Rapid microbial activity is achieved and heat is produced in the pile by regular turning and adding water when needed. This type of composting can be done in a

homemade or commercially available bin or with free standing earth-contact piles that can be built but which are likely to take up more space. The purpose of a container is to hold the compost in a shape conducive to microbial growth and to make turning easier. The main requirements for a container are openings on the sides for air to enter and easy access for turning the contents. Figures 2, 3, 4 and 5 illustrate a number of composting container options. Extension MontGuide 9204 illustrates additional container options.

To establish a compost pile, start by placing alternating layers of materials into a container. The compost pile should be three to four feet on each side, to allow retention of generated heat and air diffusion. Insulation, such as hay bales, may reduce the necessary size. As you place alternating layers of material in the container, sprinkle water in so that the material is moist but not soggy.

As layers are added, you can sprinkle a handful or two of topsoil or compost in between layers to supply a source of microorganisms. A thin layer or two of soil interspersed in the pile can also absorb odors. Although airborne microbes or those directly on the materials will usually start the composting process, one of the best additives to use to start composting is horse manure. Commercial additives or activators containing nitrogen are available but may be replaced by other less costly sources of nitrogen.

Compost Troubleshooting

Table 5 offers suggestions to trouble-shoot a problem compost pile. Most problems are solved by having adequate air, the right moisture content and the correct C:N ratio. High or low nitrogen materials can be added to correct an imbalance. Occasionally, the microbes need a little more phosphorus than is contained in the materials. A little fertilizer may be helpful.

Keep in mind these factors when deciding on the best location for the pile. A sunny location can help the pile heat up, but will accelerate drying. A windy location will cause chilling in addition to drying. These problems can be remedied with a roof or a windbreak. A site with adequate drainage is helpful to prevent puddling. Composting may be done on bare soil, sod and low vegetation, where soil contact exposes the pile to microorganisms. A pile can be built on concrete or asphalt if necessary. Any runoff can be collected and used to water plants. Building close to the garden is convenient. Keeping the pile moist is easier if it is built within reach of a hose. Compost piles should not be built near wellhead areas which are sensitive to surface contamination.

Finished Compost Product

The final product will be a dark brown material, and the pile will have cooled to air temperature. Unfinished clumps can be separated by screening, with the clumps going into a new pile. Unfinished compost can be added to the soil the fall before planting, as

Table 5. Compost troubleshooting guide (Dickson et al., 1991)

Problem	Possible Causes	Solution
Rotten odor	• excess moisture or compaction	• turn pile, or add dry porous material, such as sawdust, wood chips, or straw
Ammonia odor	• too much nitrogen (lack of carbon)	• add high carbon material, such as sawdust, woodchips, or straw
Low pile temperature	• pile too small • insufficient moisture • poor aeration • lack of nitrogen • cold weather	• make pile bigger or insulate sides • add water while turning pile • turn pile • mix in nitrogen sources such as grass clippings, or manure • increase pile size, or insulate pile with an extra layer of material such as straw
High pile temperature (>140°F)	• pile too large • insufficient ventilation	• reduce pile size • turn pile

final breakdown will occur in the soil. Adding compost to the top three to six inches of soil a month before planting will insure maximum nutrient availability to the plants. Small amounts of finished compost can be added any time to gardens if you take care to prevent damage to roots while digging and only work it in to the top few inches of soil. Some composters make a compost tea by placing compost in a burlap sack and soaking in a barrel of water. This nutrient rich tea can be used to water plants and the compost can be added to the soil at a convenient time or used as a surface mulch. Successful composting takes practice and patience, but the results are satisfying, as the home gardener builds soil quality.

Other Methods of Composting

Perhaps the easiest method of composting is to place the materials in a large plastic bag or plastic trash can, making sure there is sufficient moisture and that high nitrogen materials are present. The bag is then sealed and left alone for several months, in the sun if possible. The compost is finished when the odor is earthy. If unpleasant odors persist, more time is needed. A variation is to build a pile of material and cover it with heavy black plastic, upside-down sod or four to five inches of soil.

Sheet composting can improve soil quality over a larger area. Spread compostable materials in layers over the ground. Every four or five days, till the area to mix the materials, incorporating soil from underneath. If necessary, add water.

In trench composting, trenches about 12 inches deep by 18 inches wide are filled with compostable materials, compacted and covered with several inches of soil. Although some gardeners have success planting directly over the trench, others have reported problems with nitrogen depletion, as microbes out-compete plants for soil nitrogen. An alternative to trenches is to dig holes with a posthole digger 12 to 18 inches deep, place materials in the hole and cover with a little manure and several inches of soil. By rotating the location of the trenches and postholes, a larger area will benefit.

Additional Resources

Extension MontGuide 199204 "Composting Bins and Boxes"

Video "Turning Your Spoils to Soils." 17 min. Contact your County Extension Office.

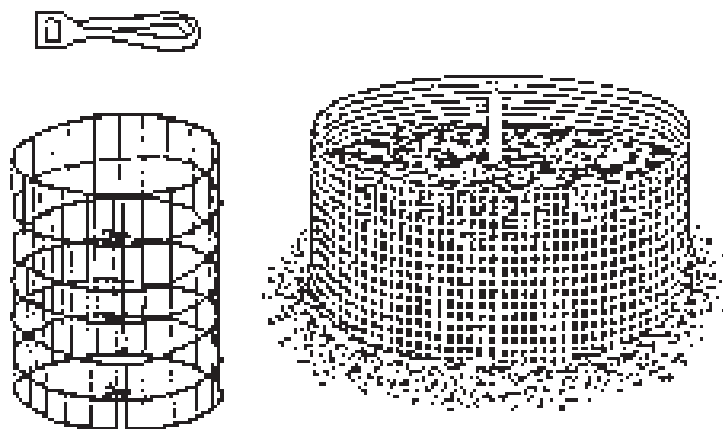


Figure 2. Wire mesh compost bins

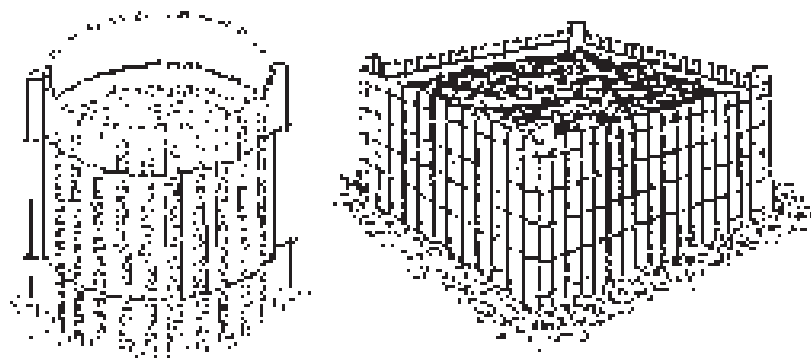


Figure 3. Snow fence bins

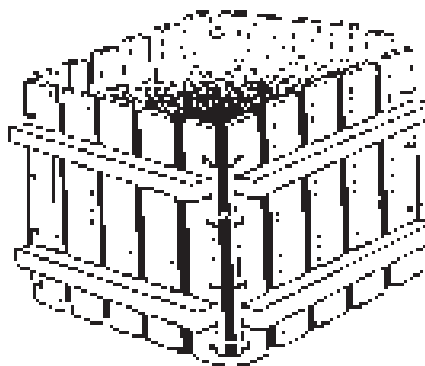


Figure 4. Wooden pallet bin

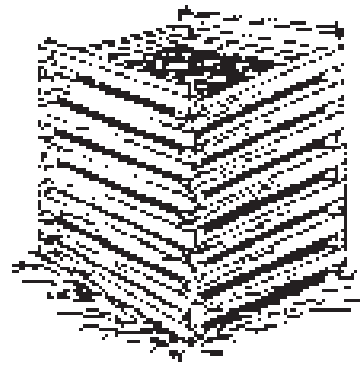


Figure 5. Lehigh-Keston bin.

Backyard Compost Questions and Answers

Q. Do I need to add fertilizer to my garden if I use compost?

Yes. Compost is a soil conditioner, not a reliable source of major plant nutrients (Nitrogen, Phosphorous, Potassium). Compost helps to improve soil drainage and moisture retention, hold nutrients from fertilization in the soil for gradual use by plants, neutralizes acid soils, and adds small amounts of minerals needed for plant growth.

Q. Can compost be used as fertilizer?

Yes, because decomposed materials have some nitrogen, phosphorous, and potassium content even though in small amounts. However, there are not enough nutrients present in the compost to supply the needs of vegetable crops and ornamental plants. Adding garden fertilizers to speed up decomposition supplies some of the nutrients as well. In general, the lack of large amounts of nutrients in compost is far out-

weighed by the other advantage of the organic material.

Q. How do I know when the compost is “finished” and ready to use?

Compost is ready to use when most of the original plant materials are no longer recognizable (some tough woody materials may still be present - these may be sifted out and returned to the compost pile). Finished compost is dark colored, sweet smelling, crumbly and looks and feels like soil.

Q. Do I need a bin to make compost?

No. Yard waste compost can be made in freestanding piles. However, bins help keep piles neat and free from disturbance by pests, and are appropriate for urban areas.

Q. What can I do with composted grass if I don't have a “garden?”

Grass clipping, composted or not composted, make an excellent mulch around shrubs, trees, and potted plants. Several inches of mulch may be added to these plantings each year. For trees planted in lawns, remove sod around the tree in a circle 3' or more in diameter to create an area for annual mulching. Finished compost may also be screened and spread on lawns. There is always a use for compost.

Q. How does compost affect the acidity (pH) of soils?

Most yard waste composts are neutral to slightly basic, and have significant buffering capacities to offset acidity in soils.

Q. What are the storage needs for compost from the average yard?

The amount of compost generated in a yard depends on the size of the yard, what is being grown there, how it is being composted and other factors. Finished compost occupies only about 30-40% of the volume of raw wastes. Storage is not usually a problem. For small yards, a holding unit should handle all of the wastes generated. Larger yards and intensive gardens may require more than one holding unit, or a turning system.

Q. Is it OK to garden in pure compost? In compost mixed with fill soil?

It is best to mix compost with mineral soils (clay loam, sandy loam)

for gardening, to have ideal texture and provide anchorage for plant roots. Clean fill soil (not pure clay!) and compost mixed in roughly equal amounts should provide a good growing medium. Plants do not root well in pure compost. Use of too much compost in the garden reportedly results in dangerous levels of nitrates in some crops!

Q. What can be done about a smelly compost pile?

Smelly piles are most often caused by too much water and poor aeration. When kitchen wastes are added to yard waste compost piles they often are too wet and create odors. The bacteria, which live in such “anaerobic” piles produce a sulphuric, “rotten egg” smell. Smelly piles should be turned to introduce air and encourage “aerobic” bacteria. Wet, compacted materials should be broken up with a pitchfork, and coarse materials such as dry straw or corn stalks may be mixed in to aid drainage, absorb excess moisture and create air spaces.

Q. Are rats and mice attracted to compost? How can I get rid of them?

Rats and mice are attracted to two aspects of compost:

1) Rats and mice are most often attracted to food wastes of all types including meats, fruits, vegetables, grains and dairy products. Food wastes should not be put into yard waste composting systems! Food wastes, excluding meat, fish and dairy products should be composted in worm bins with tight fitting lids to exclude rodents, or buried under at least 8” of soil cover. Meat, fish and dairy products should be thrown out or run through an in sink garbage disposal.

2) Sometimes rats and mice will nest in yard waste compost piles. This is not a common problem (usually they are attracted by some fruit or other food wastes which are in the pile). If rats and mice do nest in a compost pile, they can be discouraged by turning or otherwise disturbing the pile, moistening the pile, or heating up the pile through a combination of moistening, shredding, turning and adding nitrogen fertilizer.

Q. Do compost piles attract slugs?

Slugs live happily in compost piles and help to break down organic wastes. Often they are so happy there that they don't bother garden plants. However compost piles can provide daytime hiding places for slugs who may graze in gardens at night. Place compost piles in areas away from vegetable gardens or create barriers (traps, metal flashing...) around the pile to contain slugs.

Q. How can I stop flies and other insects from becoming pests around the compost pile?

Compost piles made entirely from yard wastes do not usually attract flies or other flying insect pests in large numbers. Flies are attracted to food scraps and animal manures. **Do not put any food wastes into a yard waste pile** - not even deadfall apples or other garden fruit. Compost these wastes in a worm bin or bury them under 8” of soil. If you must put fruit from your garden into yard waste compost pile, be sure to cover it with several inches of compost or soil - not just with loose yard wastes!

Q. Can yard wastes treated with chemical pesticides and herbicides be put in compost? What happens to them in the compost pile?

There are no simple, clear answers to this question. Individual chemicals react in different ways and break down under unique conditions. Decomposition of most pesticides and their byproducts have not been studied thoroughly. Often the byproducts are more toxic than the original chemicals. Some fungicides contain heavy metals which can build up in your soil.

You should never purposely dump any chemical into a compost pile. Lawn clippings with herbicides on them may kill garden plants if used as a mulch or “young” compost. At a minimum, thoroughly compost yard wastes that have been treated with pesticides (or those uncertain origin) in a hot pile and leave to cure for a full year. Do not use compost made from wastes of unknown origin on food crops.

Q. Is it safe to grow food in composted sewage sludge?

Leave sludge composting to com-

mercial composting operations!

Q. Can I compost:

—vacuum dust?

Yes. The fibers from synthetic carpeting will not decompose, but they will probably not be noticeable in the finished compost.

—glossy magazines, color inserts, colored pages from newspapers?

Some glossy papers contain toxic pigments, so these materials should not be composted. Colored newsprint is safe to compost.

—fireplace and barbeque asht?

Wood ash is an excellent source of Potassium, one of the major nutrients required for healthy plant growth. Wood ash may be safely added to compost piles in thin layers. Do not burn wood or use the ashes from wood treated with paints or wood preservatives. Charcoal (including mesquite) is just a partially burned form of wood, so as long as no other chemicals have been added, barbeque ash should be safe to compost. (Check labels on packaging to be sure). Avoid using ashes which are derived from burning large amounts of paper, these ashes may contain residues of heavy metals or chlorinated compounds.

—pet wastes?

Pet wastes (dog, cat, any carnivores) should be either buried in an ornamental garden area or compost them in their own worm bin. Compost made from pet wastes should not be put in a vegetable garden.

—any diseased plants?

No diseased plant should be added to a home composting system. Diseases may live through the composting process and spread through the garden as compost is used. (Large scale composting systems may attain sufficient temperatures to kill diseases, but home composting systems do not reliably reach these temperatures - 160 degrees F).

—weeds? How do you stop them from spreading in compost?

Annual weeds, which have not gone to seed, may be composted. Do not compost weeds that have gone to seed.

Many seeds will survive temperatures up to 140 degrees F. Even a well made "hot" home compost pile may not uniformly achieve this heat. Weeds that spread vegetatively through roots or runners, such as morning glory, quack grass, and buttercup - or ornamentals such as ivy - should not be put in compost piles even if they are shredded! Spread these plants on pavement to dry thoroughly (it may take months in moist seasons) before adding to compost.

—limbs from trees with tent caterpillars?

Do not compost limbs or other parts of trees with tent caterpillars on them. Tent caterpillars lay eggs in patches on tree branches. The eggs will hatch the following spring unless they are burned or physically destroyed.

—wood chips?

Wood chips may be added to compost piles in limited quantities. They are very rich in carbon, and their limited surface area prevents bacteria from de-composting them quickly. They will not break down completely for a long time, but will become "biologically stable" and improve drainage and aeration in heavy clay soils.

—sawdust and wood shavings?

Sawdust and wood shavings are rich in carbon like wood chips, and they have more surface area for bacteria to work on than chips do, so these materials tend to rob more nitrogen from the soil or compost initially. Sawdust should be aged/weathered before adding it to the compost pile. To balance the nitrogen demands of one cubic yard of fresh sawdust, add 3 1/2 pounds of actual nitrogen (17 lbs. Ammonium sulphate, 15 lbs blood meal, 11 lbs. ammonium nitrate, or 8 lbs urea).

—waxy, evergreen yard wastes like pine needles?

Rose prunings, Pine needles, Holly, Yews and other waxy leaves break down slower than many other wastes, but they do not pose any problem in the compost or in the garden (except rose thorns, which may attack you). Shredding these materials will help them to break down quicker and be less visible in the finished compost.

Their texture and resistance to decomposition makes them excellent for mulching to protect tender plants from frost. Compost made from pine needles is not acidic.

Q. Will mulching with wood chips or sawdust rob Nitrogen from plants?

Carbon rich woody wastes will not compete with plants for nitrogen if they are placed on the soil surface around plants. However, these wastes should not be mixed into the soil without adding nitrogen fertilizer. For this reason, it is best to use woody wastes only to mulch shrubs and trees, where the soil is not tilled and the mulch will stay on the surface. If you use sawdust in annual planting areas, add nitrogen fertilizer when turning it under. See previous answer recommendation for additions of nitrogen required to balance sawdust. Actual nitrogen "demand" of woody wastes depends on the size of the materials. Smaller particles (sawdust) have more surface area for bacteria to work on, so they demand more nitrogen than larger particles.

Q. How can wood/bark chips be made to compost faster?

Re-chipping to open more surface area, and adding nitrogen will both speed up decomposition of wood chips.

Q. Do I need to water my compost pile?

Providing adequate moisture is essential for quick composting, but if you are patient you can leave watering to nature. Untended, un-watered compost piles may take six months to two years to decompose. Occasional watering during dry seasons, along with covering piles with black plastic or old rug scraps will greatly speed up decomposition.

Q. Should compost piles be covered?

A compost pile that has good moisture content to start with will benefit from coverage with plastic or carpet scraps. Covering piles helps to keep them moist in summer and prevents them from getting too soggy and having nutrients leach out in winter.

However if a pile is too dry or soggy to start with covering may make the problem worse.

Q. Do compost “tumblers” work?

Compost tumblers or “barrel turning units” work very efficiently if wastes are chopped, moistened and contain adequate nitrogen. Tumblers with flat sides or internal baffles (like a clothes drier) are recommended as they mix and aerate materials better than those with smooth sides.

Q. Do I need to use a shredder to make good compost?

Shredders are not needed to make compost out of many yard wastes. However, shredders are useful for creating mulch out of woody materials such as branches over 1/2” diameter, waxy evergreen leaves and large volumes of shrub prunings. Shredders are also useful to prepare corn stalks and other woody vegetable wastes for quick/hot composting. These wastes may also be broken up by chopping them with a machete or shovel, or by running them over with a rotary lawn mower.

Q. Must compost be turned?

No. Turning speeds up the process, but is not necessary. Yard waste composted in a holding unit may take from three months to two years to decompose (longer for large unchipped branches), depending on the composition of the materials being composted, how they are prepared, and if the compost is turned periodically. If wastes are carefully combined to balance Nitrogen and Carbon, chopped, moistened and turned, compost can be made in as little as three weeks.

Q. How can unfinished compost be reheated?

Relatively fresh materials will heat up if turned (with proper moisture and bruising or shredding). Older “brown” materials can be reheated by adding a high nitrogen fertilizer, green grass clippings or manure when they are turned. Pouring liquid nitrogen fertilizer on a pile will also heat it up.

Q. Should you add limestone to compost?

Limestone is not needed for a good compost, and may contribute to smelly loss of nitrogen through ammonia gases. Most finished compost has a neutral to slightly alkaline pH.

Q. Should compost “starters” or soil be added to compost piles?

Starters are not essential for composting. Most “starters” are nitrogen fertilizers and/or dehydrated bacteria. The bacteria are already present on dead plant material and multiply rapidly. If a nitrogen source is needed, fertilizers are cheaper than “starters”. Soil is not needed in a compost pile, but it is not detrimental either.

Q. Do I need to add fertilizer to the compost pile?

Need for fertilizer depends on the material being composted. A mix of typical yard wastes (leaves, grass clippings, weeds...) contains sufficient nitrogen for decomposition. Nitrogen fertilizers may be added to speed up decomposition of dry woody wastes such as twigs, dried grasses, waxy evergreen leaves or wood chips. Addition of rock phosphate or other high phosphorous fertilizer will benefit compost by

reacting with other nutrients, making them more available to plants, and adding much needed phosphorous to our soils.

Q. Can sod be composted without continually re-sprouting?

Yes. Sod should be composted in piles covered with black plastic to exclude light and stop all growth. Other materials may be included in the pile, including vegetatively spreading weeds such as buttercup and quack grass which will also die without light. (Morning Glory will not be killed this way).

Q. Can you compost if you just have kitchen wastes, no yard wastes?

Kitchen wastes - without meat or fish scraps, dairy products or oily foods can be composted in worm bins along with shredded and soaked newspaper or cardboard, or buried at least 8” deep around shrubs and trees or in fallow areas of the garden.

Q. Why can't dairy products, meat or fish scraps be composted?

Animal products attract flies, rodents and other pests which create nuisances and carry diseases. These animal wastes are also more likely to create odor problems and other complications.

Q. Can coffee filters and tea bags be composted in a worm bin?

Yes. Any uncoated paper product may be composted. Worms love coffee grounds and filters, as well as tea bags. Don't try to compost coated papers such as glossy magazines or photographs, waxed paper, and treated copy paper.

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