

COMPOSTING

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1. What is Composting?

Composting refers to the decomposition of organic waste or material into organic fertilizer which can be utilized by plants in our gardens. It is one of the easiest and cheapest ways of recycling nutrients and it is something that all of us can do in our own backyard gardens. Composting involves biological decomposition process of organic material where bacteria, fungi, and other microorganisms break down organic material into stable, usable organic substances.

2. Why compost?

The application of compost to a garden has several soil improvement benefits. These include:

- Improvement of soil physical properties. These properties include the bulk density or how compact a soil is; porosity or how much water / air pockets a soil has; and aggregate stability or how the soil will hold together.
- Improvement of water movement and retention. A soil with compost or high organic matter would hold more water and also drain better than a soil without compost. Such a soil will support better crop growth.
- Improvement of soil chemical properties, including pH, soil organic matter content, and ability to hold nutrients. These properties support better crop growth.
- Protection against root diseases and weeds problem. The presence of chemicals such as acetic acid and propionic acid in manure is reputed to control weeds and root disease causing organisms.

- Reduction of soil erosion due to improvement of the physical, hydraulic and chemical properties of the soil.
- In addition composting is an alternative method of waste disposal and waste control and enhances environmental quality by getting rid of waste in an eco-friendly manner.
- It is shown reduce odor associated with landfills when municipal waste is made into compost and used as a cover.

3. What materials should be composted?

Many organic materials can be used in compost depending on what is available and nutrient appeal. The following materials can be composted:

- Organic materials such as leaves, grass clippings, straw, non-woody plant trimmings, branches, and twigs.
- Kitchen waste such as vegetable scraps, coffee grounds and eggshells.
- Sawdust can be used as an additional supplement for nitrogen, as well as wood ashes that adds lime and potassium.
- Wood ash should be added in moderate as it can reduce the nitrogen content of the compost if present in excessive amounts.
- The addition of crushed clams or oysters shells, eggshells and bone meal tend to reduce the acidity of compost.
- Livestock manure and poultry litter can be added for additional nitrogen.

4. What materials should NOT be composted?

There are some materials that can pose health hazard or create nuisance and therefore are not to be added to compost.

- Human or pet feces have the potential to transmit disease.
- Waste such as meat, bone, grease, whole eggs, and dairy products usually attract rodents and for that reason they should not be added.
- Coal ashes contain levels of sulfur that may be toxic to plants and should be avoided.
Also automotive petroleum products are best to be taken to a recycling center and not put in compost.

5. Compost Structures

Composting structures can be made from a wide variety of materials and can be design to the need of the person making the compost.

i. Compost tumbler- has a drum type unit placed between vertical heights and can be turned manually.



<http://www.planetnatural.com/product/compost-tumbler-2/>

Advantages:

- Very easy to mix and turn compost materials
- Compost is very well aerated
- Excludes rodents
- Easy to move (mobile)

Disadvantages:

- The Compost Tumbler can be expensive`
- You lose contact with your native soil for microorganisms and earthworms exchange.

ii. **Stackable compost bin**- can be made of wood and commercial types are available.



<http://www.ecoenthusiast.com/?p=3628>

Advantages:

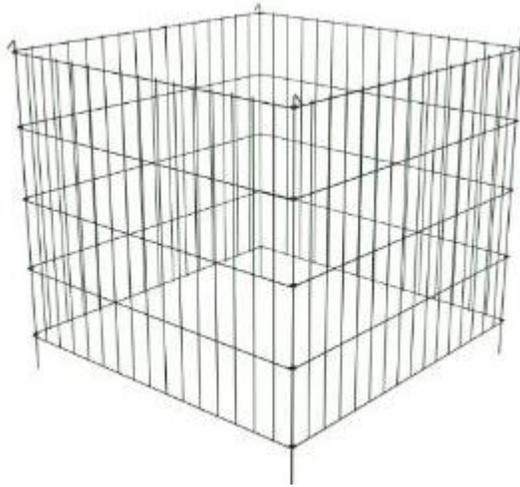
- Makes it easy to adapt to the size and volume of compost
- Compost layers are well contained and easy to manage

Disadvantages:

- Need more space for unused stacks
- Many parts (stacks) to inventory
- Building complexity increases

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iii. Wire mesh compost bin- perhaps the most versatile; easy to build and maintain



Advantages:

- Compost is very well aerated
- Easy to move (mobile)
- Rodent resistant
- Easier to work with finished compost
- Inexpensive to build
- Contact with your native soil for microorganisms and earthworms exchange

Disadvantages:

- The wire will rust within time.

iv. Fixed compost bin- Are usually fixed in one location and material can be wood, wire, brick or blocks.



<http://forums2.gardenweb.com/discussions/1702562/my-project-for-arid-climate-composting>

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Advantages:

- Contact with your native soil for microorganisms and earthworms exchange
- Easy to camouflage

Disadvantages:

- Not mobile
- Materials to build could be expensive
- Manual turning required for aeration

v. Freestanding compost pile – conveniently easy to build and maintain and organic material can be added as needed.



<http://www.katu.com/news/business/112026054.html>

Advantages:

- Inexpensive to build
- Contact with your native soil for microorganisms and earthworms exchange
- Little effort is need to maintain
- Compost location can be easily changed

Disadvantages:

- Easy for rodents to invade
- May appear unattractive if it is in plain view of neighbors

6. Requirements for Efficient Decomposition

Decomposition of organic material in a compost pile depends on maintaining the activity of decomposer microbes. Any factor that slows or halts the growth of these microbes also slows the composting process. Efficient decomposition occurs when aeration and moisture are adequate, when the particles of waste material are small, and when the proper amounts of fertilizer and lime are added. We will discuss each of these factors in more detail.

i. Aeration

Microbes require oxygen to decompose organic wastes efficiently. Some decomposition will occur in the absence of oxygen; however, the process is slow and foul odors may develop. Because of the odor problem, composting without oxygen is not recommended in residential areas unless the process is conducted in a fully closed system. Mixing 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 to produce useful compost. A well-mixed compost pile also reaches higher temperatures, helping to destroy weed seeds and disease-causing organisms (pathogens).

ii. Moisture

Composting involves microbial breakdown of organic residue. These microbes require adequate moisture to function properly. If the material is allowed to dry, the compost pile will not decompose efficiently. If rainfall is limited, the compost pile must be watered periodically to maintain a steady decomposition rate. Enough water should be added to completely moisten the pile, but overwatering should be avoided. Excessive moisture can lead to anaerobic conditions, slowing down the decomposition process and causing bad odors. The pile should be watered enough so that it is damp but does not remain soggy. It is recommended to maintain approximately 50 to 55% moisture on a weight basis as a starting point. The compost is 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 materials are too dry. If water gushes out, they are too wet.

iii. Particle size

The smaller the organic waste, the faster the compost will be ready to use. Smaller particles have much more surface area for a given volume and thus are more rapidly broken

down by microbes. Materials can be shredded before they are added to the pile. Shredding is essential if brush or sticks are to be composted. In addition to speeding up the composting process, shredding reduces the volume of the compost pile. A low-cost method of reducing the size of fallen tree leaves is to mow the lawn before raking it or to run the lawn mower over leaf piles after raking. Raked piles should be checked to ensure that they do not contain sticks or rocks that could cause injury during mowing. If the mower has an appropriate bag attachment, the shredded leaves can be collected directly.

iv. Heat

As they break down organic matter, the organisms responsible for composting generate large amounts of heat, which raises the temperature inside the pile and speeds up decomposition. A "hot" pile will produce temperatures between 140 and 160 degrees Fahrenheit.

v. Fertilizer and Lime

Microbial activity is affected by the ratio of carbon to nitrogen in the organic waste. Because microbes require a certain amount of nitrogen to live and grow, a shortage of nitrogen slows the composting process considerably. Materials high in carbon but low in nitrogen, such as straw or sawdust, decompose very slowly unless nitrogen fertilizer is added. Although tree leaves are higher in nitrogen than straw or sawdust, they still decompose more rapidly when nitrogen fertilizer or wastes that are high in nitrogen are added. Grass clippings are generally high in nitrogen; when mixed properly with leaves, they speed decomposition. Poultry litter, manure, or blood meal can be used as organic sources of nitrogen. Otherwise, a fertilizer with a high nitrogen analysis (10 to 30 percent) should be used. Other nutrients such as phosphorus and potassium are usually present in adequate amounts. During the initial stages of decomposition, organic acids are produced and the acidity (pH) of the compost drops. At one time it was believed that adding small amounts of lime in the early stages would maintain and enhance microbial activity during this period. However, lime converts ammonium nitrogen to ammonia gas, removing nitrogen from the pile. Although adding lime may hasten decomposition, the loss of nitrogen from the pile often offsets the benefits. Lime is not necessary for degradation of most yard wastes. Finished compost is usually alkaline (with a pH between 7.1 and 7.5) without the addition of lime. In many areas, the water used to moisten the compost pile is alkaline and may also help to raise the pH (reduce the acidity) of the compost. If large quantities of pine needles,

pine bark, or vegetable and fruit wastes are composted, additional lime may be necessary to reduce acidity.

vi. Ingredients

Make sure to include carbon-rich "brown" materials, like leaves, straw and sawdust and nitrogen-rich "green" materials, like grass clippings, vegetable peelings and manures (no pet droppings). When adding ingredients to your compost pile, try to mix a ratio of three parts brown materials to one part green (see Carbon-to-Nitrogen Ratio). A well-balanced "diet" will ensure that composting doesn't take too long and that you don't end up with a slimy, smelly heap.

7. Location

A compost pile should be in close proximity to the place it will be used, and at a place where it will not offend neighbors or interfere with activities in the yard. Composting is best done in a location screen from your view and that of neighbors. Most common and viable locations are around and near the garden or in a service area. It is important not to place a compost pile near a well or on a slope that drains to surface water sources, such as stream or a pond. Compost piles that are near tree can be difficult to handle, as roots can grow to the bottom of the pile and make turning and handling strenuous. It is also important to avoid areas that may have or are prone to drying winds as this may decrease the moisture content of the pile. It is also equally important to have adequate sunlight in the compost pile. The more wind and sun the pile is exposed to, the more water it will need.

8. Preparing the Compost Pile

- Locate your composter on bare soil. Somewhere in your garden that is easily accessible all year round.
- Mix your green and brown materials evenly when composting.
- When composting you should put a lot of materials in all at once.
- Chop large items into smaller pieces to help with the process.
- Ensure that your compost is moist but not wet:
 - when squeezed in your hand, a few drops of water should be produced.
 - add water if it is too dry
 - cover and add dry material if too wet.

9. Applying Compost to Improve Soil

Once you have achieved finished compost, you can add it to your garden any time of year without the fear of burning plants or polluting water. For best results, add compost at least two to four weeks before you plant. That will give it time to work its magic and integrate with your soil. Try to work the compost in at least six to eight inches deep and shoot for a ratio of compost to soil of about half to half. Also, consider "side-dressing" your rapidly growing plants with this "garden gold" during the late spring or early summer. Place the compost at the side of the plants and incorporate it into the soil. Keep the compost about an inch away from the stem of the plant.

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