

Composting in an Arid Environment

Why should I compost?

Composting is a great way to reduce the waste created in the home and utilize it instead of sending it to a landfill. The product of composting is an excellent nutrient-rich material that can be used to fertilize gardens and trees- improving productivity and quality in your garden while saving you money on fertilizer.

A garden that is fertilized with composted materials can better hold oxygen and water, drain more efficiently, and produce plants with fewer insect and disease problems. Composting produces humus and a range of beneficial microorganisms(which discourage harmful ones) that result in healthier soil and plants. One composting aficionado states that “You are not producing compost – you are producing micro organisms!” .Different composting methods have been developed to best meet environmental conditions (eg: humid/tropical, dry/arid). Special considerations, which are described below, need to be made to compost effectively in arid environments where a lack of ambient humidity may desiccate organic matter before it has time to decompose.

Can I compost?

An assessment should be made before setting up a compost pile, to determine if composting is even a possibility. Reducing waste is one reason why people compost, however, most people compost in order to create fertilizer that improves garden productivity. The main considerations for composting in an arid environment are 1) time, 2) effort, 3) sufficient water.

As shown below, the no-tending method require very little time, but the composter may encounter difficulties if the pile is not given any attention (see *Troubleshooting* below). If that is the case, the composter must determine if the payoff is worth the time needed to tend the pile.

If the pile is tended, some effort is required. It is understood that many people are busy with work and other household chores and mixing a composting pile may not be a priority. Thus, if the no-tending composting pile does not work, then, once again, the user must weigh effort versus payoff and decide if composting is appropriate.

The third consideration, having sufficient water, is important in an arid environment. Obviously, it is not going to be appropriate to compost if water is needed, yet scarce. Keep in mind, however, that dirty water from the kitchen (dishwater, for example) and urea can be used.

There are various ways to compost – basically aerobic and anaerobic. The following process describes an aerobic system. Closed compost bins are an example of an anaerobic system and require different processes. Many of the ingredients classed as not acceptable in an aerobic system may be acceptable in a closed vermin proof system.

How does it work?

Composting is the process of breaking down and decomposing organic matter. Microorganisms in the pile feed on the material that you put into the compost, and in return give off CO₂, water, heat and humus. Humus is the stable organic end product that holds the nutrients that can then be used in your garden.

The microorganisms that do the composting work are bacteria and fungi. The fungi break down the tougher debris in the compost pile, allowing the bacteria to continue decomposing the broken down material.

These microorganisms in your pile survive on the organic ingredients or your compost, but they need certain conditions to survive and work most efficiently. Moisture is an important element; compost piles should contain 40-55% moisture, like a wrung out wet sponge. Too little moisture desiccates the microorganisms, and too much drowns them. Temperature is another important aspect too. Though there is a range of temperatures that all the different organisms thrive at, the pile should not reach above 65°. Temperatures below 55° don't kill the pathogens that are unsanitary to humans, but lower temperature composting is effective also, it just takes longer.

The bacteria live on the contents of the pile, but the actual active “feed” is the carbon and nitrogen that is contained in the organic matter, along with the oxygen necessary for aeration. This is what the microorganisms use to make up their bodies. The ideal mixture for your compost pile is to have a 30:1

ratio for C:N, but this does not need to be a precise measurement, and can be judged on the heat and smell of your compost- see below under *How do I maintain it?*

What can I compost?

Composting is a great way to deal with food scraps, yard waste, and animal manure. These things are all great additions to a successful compost pile, and add different nutrients to the mix. Most kitchen waste is great to throw in, including fruit and vegetable scraps, egg shells, coffee grounds and filters, greywater, corn cobs and more. Kitchen waste is usually high in moisture, which makes it an important component in arid-environment composting. Dairy products can be composted, but should be buried in the pile to avoid the smell that they generate, which may attract animals. Fatty foods like meat and oils should not go in your compost pile.

Acceptable	Not acceptable
Eggshells	Bones
Coffee grounds	Fish
Fruit scraps	Meat
Vegetable scraps	Oils
Corncobs	Dog and cat feces
Leaf litter/branches	Breads and grains
Graywater	Dairy products
Fire ashes	
Cattle manure	

Ingredients for the compost heap (no matter what method is used) are :

Organic materials - anything that has been alive can be composted! -- but like making a cake, there needs to be some balance in the ingredients. The two broad categories of compost materials are high-Carbon (woody, brown, dry) to high-Nitrogen (fresh, wet, green). The microbes that work in the compost digester need a starting ratio of approximately 30 Carbon to 1 Nitrogen to make protein (ie their body mass) -- thus as good heap designers, this is what we should be aiming for as an overall ratio. If you want to start getting really technical, you can analyse the compost ingredients. As each have their own balance of C/N, the overall ratio of the assembled heap needs to be adjusted accordingly (see table).

Material C/N ratio

- Sawdust 450
- Paper 150
- Straw 100
- Leaves 60
- Fruit wastes 35
- Lawn clippings 20
- Food wastes 15
- Weeds 19
- Chicken litter (typical) 10
- Cow manure 12
- Chicken manure (no straw) 7

It also helps to have the materials in small pieces -- this increases surface area and makes it easier to get an even mix. A mulcher will chop woody materials up nicely -- a lawn mower can do almost the same job

on small pieces of twigs and cardboard. You may also have to 'stockpile' materials until you have enough to make a heap.

- Micro-organisms -- hundreds of species of bacteria and fungi are involved in the composting process. But don't worry about arranging the party invitations -- as soon as you assemble your compost heap, all the guests arrive automatically and get to work multiplying up into huge numbers. Its Free!!
- Moisture -- it is very important to keep the heap at the correct moisture level. Too dry and the decomposition process will stop (you will be able to tell if this has happened as the ingredients will remain unchanged week after week, sometimes with dry powdery white fungi, and sometimes with the invasion of slaters). Too wet and the anaerobic bacteria will flourish leading to a different kind of decomposition, including foul smells. Regular turning and regular watering will help to maintain the correct balance of moisture throughout the heap. Also, keep the heap protected from heavy rain which can make it too wet and leach compost products away

Oxygen -- The bacteria we seek to encourage in the compost heap are aerobic (air/oxygen loving) as opposed to anaerobic (air/oxygen hating). Thus we need to supply a constant supply and resupply of oxygen throughout the heap. This is the primary reason why the heap is turned regularly.

Soil

Some composting experts recommend the incorporation of thin layers of good loamy soil in your heap with helps to retain moisture and also adds microorganisms.

Insulation.

In winter you may want to insulate your heap with a layer of underfelt to conserve heat especially if your heap is small. In summer you may want to do the same to reduce evaporation. In very wet places your compost heap may need a raincoat to stop it getting waterlogged!

What do I need?

The equipment for simple composting is minimal and based primarily on how you choose to compost. Throwing compost into an easily accessible pile is the lowest maintenance option. In that case, the only tools necessary are a shovel or stiff-tined fork for turning and removing compost. To ward off unwanted pests (animals, large birds) it is a good idea to protect it using some type of fence. Alternatively, you could build a wire-mesh box, which not only protects it from animals, but makes it easier to move around when full. The drawback to confining it is that then the compost does not have contact with the soil, which provides microbes, worms and bacteria to speed up the process.

How do I maintain it?

One method of composting entails throwing organic matter into a wire mesh box, and is classified as a "hot and fast" method that will produce compost from a cubic meter pile within a few months or less. It does require turning several times a week, which is done by mixing it with a stick or shovel. As turning does lead to dehydration, and thus slowing of the decomposing process, in arid environments, add water when turning. The heat generated from this hot process kills weed seeds and harmful bacteria and may be more than enough heat to discourage vermin from your heap. The centre of the heap can get too hot to leave your hand in! If the compost is drying up, a passive approach can be taken, though composting time is much longer (up to a year). The decision is based on 1) how much waste is produced and needs to be managed 2) environmental conditions (ie: humidity) 3) quantity of compost needed and 4) the eagerness of the composter.

Regardless of whether an active or passive approach is adopted, the compost should be checked for moisture periodically, important in arid regions. As mentioned, it should be as moist as a wrung-out sponge. If necessary, add water to maintain the appropriate moisture level. In particularly parched areas, using dirty dishwater or adding urea are effective water-saving options.

Compost with lots of kitchen scraps does have the potential to attract flies and animals. The box method, as mentioned, should discourage animals. To ward off flies and insects, be sure to cover new organic matter with about 8 inches of old compost.

How to use it?

The organic matter is thoroughly decomposed and ready for placement when the material is brown, crumbly, and earthy-smelling. If it is not fully broken down (material is still somewhat recognizable), then it should be allowed to further decompose, or be separated out. The humus can be used on vegetable gardens and trees. If little organic matter is present in the native soils, a two to three inch layer of compost should be worked into the top six inches of soil. Following the first year, only ½ inch of compost is necessary to maintain soil quality.

Finished compost should be dark, fine and spongy with a pleasant earthy smell. You should not be able to recognise any of the original ingredients in it!

- The finished material can be applied directly to form a surface layer which conditions, fertilises and suppresses diseases in the soil. You can't harm plants by putting on too much, but to make it go as far as possible, a minimum layer of 5cm is recommended. In Australian conditions, exposed layers of compost on top of the soil will quickly dry out and 'die'. Thus a thick layer of mulch (straw, cardboard etc) should be placed on top immediately to protect it. New plantings can be dug through this protective top layer.
- Also recommended is to make a 'tea' with the compost by soaking it in water, then aerating it to build up the flora volume again. This can be filtered and sprayed onto the garden or onto the leaves of plants
- Sifted and mixed (1 part) with sharp sand (3 parts) and peat or coconut mulch, (3 parts), it becomes seed raising mix

Compost Clinic

Troubleshooting - here's the shortlist of common problems.

Symptom	Cause	Fix it
Bad odor	Poorly aerated	Turn it
Dry (visible grey mould present)	Not enough moisture	Add water
Nothing is happening	Not enough nitrogen Not enough oxygen Not enough water	Add manure Turn it Add water
Ammonia odor	Not enough carbon	Add leaves

"Crikey!. something's not quite right here!!" Look upon your compost heap as a living organism - to find a cause for any ailment in your garden's digestive organ, go back to the basic ingredients listed above (balance of ingredients, water, oxygen) and diagnose your heap against each one.

"It stinks!!" -- this could be the result of a couple of common problems

- noxious fumes are produced by anaerobic bacteria ie, not enough oxygen is available throughout the heap, or its too wet or has large lumps of wet sludgy material. Or large amounts of unmixed kitchen waste
- Excessive nitrogen is unbalanced by too little carbon, and the heap is venting as ammonia gas. One remedy which would address both problems could be to turn the heap to aerate it more often and to add in some drier, fibrous, carbon rich material (eg straw)

"Nothing's happening!"

Your heap has done nothing for days and days on end -- no heat, no change in structure of the ingredients. This could be because of:

- Too little water -- your heap is dry, effectively stopping any biological activity. Turn the heap, spraying with water constantly.
- If the ingredients are too rough or large this will also slow things down. Remedy is to remake the heap after chopping up the rougher ingredients (eg run the lawn mower over them!).
- Not enough nitrogen -- turn the heap and add more manure or lawn clippings as you do it.

Sources: <http://peacecorps.mtu.edu/resources/studentprojects/composting.htm>

<http://www.permaculture.org.au/topics/compost.php>