

WHY COMPOST?

Across the UK many councils have now restricted or banned grass clippings, leaves and lawn waste from landfill dumping *sites*. The homeowner *is* responsible for finding a way to properly dispose of these materials. Composting is the natural choice for the environmentally garden owner.

Soil should be alive with million of microorganism which make complete the nitrogen cycle and move air and water through the soil. All of these activities are essential for healthy plant life. Microorganisms are in abundance when the soil contains rich, high - grade humus. This humus *is* compost made from the ordinary lawn, garden and kitchen waste. The benefits from composting are that plants and vegetables show greater *stress* resistance, the soil texture is improved, the available nutrients are stabilized, the weed seed and pathogens are destroyed through the heating cycle and beneficial microorganisms and soil fauna are supplied in abundance. The use of composted material increases water retention, drainage, nutrients holding capacity and accelerates nutrients release rates.

To be a successfully in composting, you have to understand the following factors:

1. The basic process that organic materials go through to produce compost.
2. Some effort is required.
3. It takes willingness to experiment.
4. No matter what you do, or how many mistakes you make. You are probably going to produce good, usable compost.

Unlike natural humus, when synthetic fertilising chemical are added to the soil, there can be devastating consequences. The soil that was once alive with activity, is slowly killed by the harmful chemicals. The environment suffers as well, creating a health threat to families with toxic fertilisers are herbicides and polluting our ground water, river, lakes and streams.

HOW COMPOST IS PRODUCED?

Composting by definition is the biodegradation of fibrous materials to create usable forms of fertiliser. Decomposition is an integral part of the natural life cycle. Organic matter is decomposed by the process of oxidation, reduction and hydrolytic enzymes. The process produces nutrients used by the microorganisms for further breakdown, enabling bacteria to carry on their life processes of growth and reproduction.

The rate of oxidation and biological degradation of organic matter varies within the compost heap. Some compost heaps heat up very rapidly. The heat in the composting materials is produced by bacterial activity (biological burning). By using **Travena CompostPlus** activator, this critical buildup of heat can be sustained, significantly reducing the time of composting. As materials are used up or decomposed and bacterial activity slows down - the compost heap will begin to cool. This biological reduction of organic matter is how compost is produced.

The raw materials that you add to your compost heap will have to be of biological origin in order to decompose down to finished compost. Grass clippings, leaves, kitchen vegetative waste, weeds, Sawdust, straw, shredded newspapers, etc., can all be composted. As compost is broken down from these raw materials to simpler forms of proteins and carbohydrates, it becomes more available to a wider array of bacterial species that will carry it to a further stage of decomposition.

Carbohydrates (starches and sugars) break down in a fairly rapid process to simple sugars, organic acids and carbon dioxide that are released in the soil. When proteins decompose, they readily break down into peptides, amino acids. and then to available ammonium compounds and atmospheric nitrogen. Finally, species of "nitrifying" bacteria change the ammonium compounds to nitrates., in which from they are available to plants.

At this stage of decomposition, the materials are near to becoming finished compost, with the exception of a few substances that still resist breakdown. Through complex, biochemical processes, these substances are the rest of the decomposed form humus.

The composting microorganisms, like any other living things, need both carbon from the carbohydrates, and forms of nitrogen from the proteins in the compost substrate. In order to thrive and reproduce, all microbes must have access to a supply of the elements of which their cells are made. The principle nutrients for bacteria, actinomycetes and fungi are carbon (C), nitrogen (N), phosphorus (P) and potassium (K). Trace elements are needed in minute quantities.

These chemicals in the compost pile are not in their pure form and certainly not all in the same form at the same time. For example, at any given moment, nitrogen may be found in the composting matter in the form of nitrates and nitrites, in ammonium compounds, in the complex molecules of undigested or partly digested cellulose, and in the complex protein of microorganism protoplasm. There are many stages of breakdown and many combinations of elements. What's more, microorganisms can make use of nitrogen and other elements only when they occur in specific forms and ratios to one another.

The carbon/nitrogen ratios are a general guide to help determine the proper balance of ingredients. [The ideal C/N ratio for most compost microorganisms is about 25:1.](#) Materials too high in carbon make composting inefficient, and it will take longer for the decomposition. This *is* why a pile of oak leaves or a mound of sawdust and wood chips will sit for years without much apparent decay. Materials too high in nitrogen will likely release the excess smelly ammonia gas. I prefer to put up with a slight odour and keep surplus of nitrogen in the pile just to make sure there is always enough to speed decomposition.

CARBON / NITROGEN RATIO FOR VARIOUS COMPOSTABLE MATERIALS:

High Organic Carbon		High Organic Nitrogen	
Fruit wastes	35:1	Humus	10:1
Leaves	40:1	Alfalfa Hay	12:1
Sugar Cane Residues	50:1	Alfalfa	13:1
Cornstalks	60:1	Kitchen Scraps	15:1
Oat Straw	80:1	Green Sweet Clover	16:1
Straw	80:1	Rotted Manure	15-25:1
Paper	170:1	Grass Clippings	19:1
Sawdust	500:1	Mature Sweet	23:1
Wood	700:1	Legume-Grass Hay	25:1

The C/N ratio need not be exact. Optimum for most microorganisms is 25:1

Example: How to calculate combined C/N ratios.

Material to be composted Percent used C/N ratio

Grass Clippings 75% x 19 = 14.25

Leaves 25% x 40 = 10.00

Combined Carbon/Nitrogen Ratio: 24.25:1



ENVIRONMENTAL FACTORS AFFECTING DECOMPOSITION:

There are three environmental factors affecting the interwoven chemical and microbial breakdown of the organic matter.

1. Oxygen:

Composting can be defined in the terms of availability of oxygen. Aerobic decomposition means that the active microbes in the heap require oxygen, while in anaerobic decomposition, the active microbes do not require oxygen to live and grow. Temperature, moisture content, the size of bacterial populations, and availability of nutrients limit and determine how much oxygen your heap uses.

2. Moisture:

The amount of moisture in your heap should be as high as possible, while still allowing air to filter into the pore spaces for the benefit of aerobic bacteria. Individual bacterial hold various percentages of moisture in compost and determine the amount of water that can be added. For example, woody and fibrous material, such as bark, sawdust, wood chips, hay and straw have the capacity to hold up to 75 to 85 percent of moisture. " Green manure". such as lawn clipping and vegetable trimming are able to hold 50 to 60 percent moisture.

The minimum moisture content at which bacterial activity takes place' is from 12 to 15 percent. Obviously, the moisture content of a composting mass approaches these low levels, the slower will be the compost process. As a rule of thumb, the moisture content becomes a limited factor when it drops below 45 or 50 percent.

3. Temperature:

Temperature is an important factor in the biological of a compost heap. Low outside temperatures during the winter month's slowdown decomposition process. while warmer temperatures speed it up. During the warmer months of the year, intense microbial activity inside the heap caused composting to proceed at extremely high temperatures. The microbes, which decompose the raw materials, fall into basically two categories: mesospheric those that live and grow in temperatures of 50 °F to 113 °F (10 °C to 45 °C) and thermophilic those that thrive in temperatures of 113 °F to 158 °F (45 °C to 70 °C). The initial heat heap phase that most garden compost goes through is thermophilic. The organic material dehydrated very quickly in this phase and should be kept aerated and moistened. The high temperatures are beneficial to the gardener because they kill weed seeds and germs that could be detrimental to vegetation. The next holds at 100 °F for a while and different microbes predominate. Then finally, the ambient phase where the pleasant earthy odor originates and material has produced compost.

EVALUATION YOUR FINISHED COMPOST PRODUCT

Following are several checkpoints with which you can gauge the success of your compost. These points will serve as a standard from which you can determine the efficiency of your composting methods.

- 1.) **Structure:** The material should be medium loose, not too tight, not packed, and not lumpy. The more crumbly the structure, the better it is.

- 2.) **Colour:** A black – brown colour is best : pure black, if soggy and smelly denotes an unfavorable fermentation with too much moisture and lack of air.

- 3.) **Odour:** The odour should be earthlike, or like good rich soil or humus. Any bad smell is a sign that the fermentation has not reached its final goal and that bacteriological breakdown processes are still going on. A musty, like odor indicates the presence of mold.

- 4.) **Acidity:** A neutral or slightly acid reaction is best. Slight alkalinity can be tolerated. Remember that too acid a condition is the result of lack of air and too much moisture. Nitrogen-fixing bacteria prefer the neutral to slightly acid reaction. The pH range for good compost is, therefore, 6.0 to 7.4. Below 6.0 the reaction is too acid for the development of nitrogen-fixing bacteria. Under certain circumstances, a reaction of 5.5 is required: for instance, for potatoes, azaleas, rhododendron, alpine flowers. In this case, increase the amount of leaves.

- 5.) **Moisture:** Most of the composting failures we have seen have resulted from a failure to maintain the proper moisture conditions. Moisture content should be like that of a wrung-out sponge. That is, no water should drip from a sample squeezed in the hand. Never let the compost get dry.

TROUBLE SHOOTING CHART

SYMPTOM	POSSIBLE CAUSE	SOLUTION!
1. Unpleasant odour from compost heap.	Not enough oxygen due to compaction.	Require to Aerate.
	Not enough oxygen due to over watering.	Add more carbon materials to over watering, such as cornstalks, soak up excess water.
		Also improve aeration.
2. Compost heap not heating up	Mix in a nitrogen invariably a heap that does not heat up or decay quickly enough is made from materials too low in nitrogen. Nitrogen is a principle nutrient microorganisms need.	Source such as fresh grass clippings, or Travena CompostPlus activator and rotate the drum several times.
	Not enough moisture	Stick a garden hose down into the pile in several locations and water or poke holes into the pile with a rod and pour water down the holes using a watering can.
	Compost may be finished. If it looks dark and crumbly and smells earthy instead of moldy or rotten, it's probably ready.	
3. Compost temperature is persistently high	The composting mass is big enough, it is acting as an insulator to prevent heat loss, causing uneven break down.	Use a stick to bring material from the outside of the drum into the center and rotate.
4. Compost is damp and warm only in the center	Heap is too small and fill the drum.	Gather more materials
5. Nothing is happening	You were daydreaming while reading this material.	Read the material again.