

COMPOSTING

Temperature, Aeration and Moisture

Composting begins soon after the various raw materials have been piled together. Initial mixing of the raw materials introduces oxygen into the pile, which is consumed by the microorganisms. As the supply of available oxygen decreases the aerobic decomposition process slows. Aeration through the action of mechanical turning of the pile is necessary to re-introduce oxygen and rebuild windrow porosity to ensure that the composting process remains aerobic. Although the pile is aerated by turning, the new oxygen within the pore spaces is quickly depleted. The most important effect of turning is rebuilding the porosity, thereby improving passive air exchange. Turning also releases heat, water vapour and trapped gases, and brings the material from the interior of the heap to the outside, allowing the materials to compost evenly.

If the compost smells like rotten eggs, vinegar or sour milk, parts of the pile has become anaerobic, and need more oxygen. Under anaerobic conditions, volatile organic acids, phenols and terpenes are produced. These compounds can be detrimental to the growth of plants and beneficial bacteria, fungi, protozoa and nematodes.

Since the release of heat is directly related to microbial activity, temperature is a good process indicator. During active composting the temperature will fall if oxygen becomes scarce, due to a decrease in microbial activity. The temperature will increase again if the pile is turned. If oxygen is available and microbial activity is intense the temperature may get extremely high (above 60 °C). At this temperature many microorganisms become dormant. If the compost smells burnt, or the compost becomes black (not dark brown), the temperature is too high. Cooling the pile by turning helps to keep the temperature from reaching these damaging levels.

A compost pile should be of sufficient size to prevent rapid dissipation of heat and moisture, yet small enough to allow for good air circulation. The shape and size of your pile will ultimately depend on the raw material that you will be using and the level of management that you are capable of. The cost of turning must also be considered. The more often compost is turned, the more expensive the compost. Static piles may be more feasible for small growers. For static pile operations, careful construction of the pile is necessary to avoid anaerobic conditions, and to allow for adequate heat loss.

Moisture must be adequate for the growth of microorganisms. Too much moisture results in reduced oxygen diffusion, leading to anaerobic conditions. Too little water causes the composting process to stop.

A pH between 5.5 and 8.5 is considered optimal for compost microorganisms. As bacteria and fungi digest organic matter they release organic acids. During the early stages these acids accumulate and result in a drop in pH, which encourages the growth of fungi and the breakdown of lignin and cellulose.



Adequate moisture levels are required.
Here water is applied during the turning process.