Composting Resource Sheet

adapted from Composting in Schools

by Cornell University

Temperature

The temperature is affected by
1. The size of the pile
2. Its moisture content
3. Aeration
4. Carbon/nitrogen ratio
5. Ambient temperature

Optimum temperature is below 70°C because hotter temperatures will kill off beneficial microbes. Turning will help to dissipate the heat. The thermophilic stage (40°- 60°C) lasts for several weeks to several months, depending on the size of the system and the composition of the ingredients. Maintaining the thermophilic stage is important in controlling thermosensitive pathogens, fly larvae, and weed seeds, and is the period of rapid decomposition. As the compost cools turning the pile will result in a new temperature peak due to the replenished oxygen supply and the exposure of organic matter not yet decomposed. The curing of the compost takes place when the temperature drops and the mesophilic microbes take over the decomposition. This long process is needed to make the organic matter stable, and suitable for use with plants.

Particle Size

Microbial activity takes place on the surface of the organic particles. Decreasing particles increases the surface area. If the particle size is too small and compact, air circulation is decreased and the O_2 available to microorganisms within the pile is limited and will adversely effect the microbial activity. Optimum size for particles is 1.3 to 7.6 cm (about .5 to 2 inches).

Aeration

If O_2 levels fall, and CO_2 concentration increases, odor problems may arise. Aeration can be accomplished by inclusion of air pipes, forced air flow, or mechanical mixing or turning.

Moisture

The optimum moisture content for composting is 50-60%. Too little moisture (<30%) inhibits bacterial activity; too much moisture (>65%) results in slow decomposition, odors and leaching. The moisture contents of some common materials are shown below.

Material	Moisture	Carbon
Lettuce	87%	45%
Peaches	80%	42%
Food scraps	80%	42%
Grass	77%	45%
Leaves	35%	50%
Dry dog food	10%	
Newspaper	5%	
Dry leaves	3%	50%

To calculate the percent moisture of the materials you plan to compost:

1. Weigh a small container
2. Weigh 10 grams of the material and place in the container
3. Dry the sample for 24 hours in a 105-110°C oven
4. Re-weigh the sample, subtract the weight of the container, and determine the moisture content using the following formula:

   Moisture Content =

   ((Weight of Sample - Dry Weight)/Weight of Sample) X 100

To calculate the quantities of various material to combine the reach your moisture goal of 50-60% the general formula is:

Total Moisture Content=

$$\frac{(\text{quantity material}_1 \text{ X moisture content}_1)+(Q_2 \text{ X } M_2)+(Q_3 \text{ X } M_3)+ \ldots}{Q_1 + Q_2 + Q_3 + \ldots}$$

Carbon/Nitrogen Ratios

Carbon is an energy source and the basic building block making up about 50% of the mass of microbial cells. Nitrogen is a crucial component of proteins, and bacteria need plenty of nitrogen for rapid growth. For most materials, a C/N ratio of about 30 to 1 (by weight) will keep these elements in approximate balance.

If composting high carbon material such as leaves, additional nitrogen may be required. This can be achieved by adding a small amount of nitrogen fertilizer. An ammonia odor will indicate that too much nitrogen was added.

Monitoring the Composting Process

Moisture

If your compost starts to smell bad, chances are it's too wet. Adding material such as wood chips, cardboard pieces, or newspaper strips is likely to alleviate the problem. If the temperature drops sooner than expected and the compost looks dry, try mixing in some water.

Temperature

A well-constructed compost system will heat up to 40 or 50°C within two or three days. You can check the temperature by using a probe that extends to the center of the compost pile. The temperature will drop at a rate that varies by the type of material being composted, size of the pile, moisture, etc.

Odors

A well-constructed system will not produce offensive odors, although it will not be odor-free. Your nose is the only equipment you need to monitor odors. An ammonia odor will indicate that your system is too rich in nitrogen, and you need to add a carbon source such as leaves or wood shavings. A musty odor indicates the compost is too wet. Mix in a bulking agent. A foul sulfurous odor shows that your mix has gone anaerobic: aerate and add an additional absorbent material such as wood chips or sawdust.