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THE PROCESS AND CHEMISTRY OF COMPOSTING

Composting is an ancient process which produces an end product that can be a valuable soil amendment. When the process is applied to municipal garbage, sewage sludge, and other materials it reduces the total volume of material, stabilizes the nitrogen, and kills pathogenic bacteria. The reason it has not been used widely is that it has been cheaper and easier to landfill garbage and other refuse. Landfills no longer being the first choice for disposal, there is renewed interest in composting.

The basic process of composting is the digestion of organic and nitrogenous materials by bacteria and molds, and the release of carbon dioxide, water, and heat as part of this process. The end product is a fairly homogeneous mass of undegradable and slowly degradable material, bacterial matter, and mineral matter. The final mass will be only about half of the weight of the initial mass, and about one third of the volume. It will be essentially free of pathogenic bacteria.

The ideal beginning mixture has a small and uniform particle size, contains 45 to 55% moisture, and has a carbon:nitrogen ratio of 30:1. This is often achieved by mixing dry material high in carbon, such as leaves or straw, with wet material high in nitrogen, such as sewage sludge. Lawn clippings have moisture, nitrogen, and carbon levels such that they can be added in almost any proportion without adversely affecting the mix.

As microbes begin to digest the mixture, the temperature rises from ambient to as much as 160˚F, then stabilizes and slowly declines. The pH falls from near neutral, about pH 6, to as low as 4.5, then rises as high as 8.0 before falling gradually to just above neutral. Microbial populations change to accommodate these changes, with the fastest rate of decomposition occurring when the temperature reaches 140˚F. The compost mass must be aerated periodically to maintain the most desirable microbial population. If this is not done, conditions within the compost are likely to become anaerobic. This will result in slowed decomposition and strong disagreeable odors.

After the compost has gone through the heating process and has cooled to ambient temperature there will be additional desirable bacterial activity for at least two weeks. After this, the carbon:nitrogen ratio will be a desirable 12:1 and can be applied to soil without competing with crops for nitrogen in the soil. Nitrogen in the compost will have been converted from soluble forms, such as ammonia in sewage sludge, to less soluble forms by the bacteria. Inorganic matter will remain in the compost, and will be concentrated in proportion to the loss of organic matter.

When municipal wastes are used for composting, there is a potential for measurable quantities of heavy metals and lawn pesticides to be found in the mixture. While these are seldom present in hazardous amounts, it is a reasonable precaution to perform periodic analyses for these contaminants.