The Compost Pile

By L. H. MacDaniels

One of the problems of the home gardener is maintenance of the organic content of the soil. In large scale farming operations, crop residues are returned to the soil by plowing, and additional organic matter may be obtained from animal manures and crop rotations including nitrogen fixing legumes. The greatest benefit to the soil is secured by returning crop residues to it before they have decayed or leached in any composting process. For the home gardener, however, incorporating organic roughage in the soil is difficult because he or she lacks the tools to do it. Further, and perhaps more important, the immediate effect of any large amount of roughage in the soil is to reduce the nitrogen available to the crop while the roughage is decaying. This results in poor crop growth unless additional nitrogen is added. Composted material can be incorporated into the soil without adding nitrogen. Another purpose of the compost pile is to reduce miscellaneous unsightly roughage to such condition that it can be applied directly to the soil in the same way that peat or other commercially available organic materials can be used. Composting also gives the satisfaction of recycling organic wastes as a conservation measure while, at the same time, helping to solve the solid waste disposal problem.

The value of organic matter in the soil is unquestioned. Its presence improves soil tilth by the aggregation of the soil particles, increases the soil's water-holding capacity, and releases nitrogen and other nutrients for plant use as it decays. Carbon dioxide from decaying materials combines with water to make a weak acid that promotes more rapid movement of mineral nutrients into solution so they can be available to plants. Organic matter benefits the soil in many additional ways also. In this discussion no distinction is made between humus, a relatively stable organic constituent of soils that can be modified only slowly, and crop residues in various stages of decomposition that, together with humus, form the organic soil ingredients that give the beneficial effects.

Practically any plant material can be composted for garden use. Leaves are ideal, but old sod, manure, lawn clippings, fine wood chips, straw, old hay, and plant refuse from the vegetable garden or the kitchen can be used. Mature cornstalks and woody prunings should be mechanically shredded and may take more than one year to form compost. Newspapers can be composted provided they are finely shredded and mixed with other material along with a supply of nitrogen. Whether or not having a compost pile is worthwhile depends on the amount of organic roughage available. On a small property with a garden, not enough roughage is produced to maintain the organic matter in the soil at a satisfactory level. Additional leaves for composting can often be obtained from neighbors who do not use them or from street sweepings. This is obviously a limited practice and the chief value of composting is its contribution to the disposal of solid waste.

Basically, composting is a disintegration process. The structure of miscellaneous organic roughage is broken down by the action of bacteria, fungi, and a host of other soil-infesting organisms to a more or less uniform fine textured material valuable as a soil amendment and fertilizer. In the process much of the energy in the roughage is lost in the form of heat, the volume is greatly reduced, and some nutrients are lost by leaching or by escaping as ammonia gas. Some of these changes are illustrated in the cover photo taken in the spring of 1975 showing compost piles built in the fall of 1972, 1973, and 1974. The accompanying figure (figure 1) shows the texture of the material in August 1975. Soil analysis of these piles is shown in table 1.

Table 1.
Nutrient content* of compost piles of different ages. Samples taken August 1975.

Age of Compost	*Nitrates*	*Phosphorus*	*Potassium*	*pH*	*Soluble salts*
3 years	20	15	40	7.1	39
2 years	38	18	50	6.9	53
1 year	137	20	250	7.6	130

*Spurway test, parts per million in extract solution.

To provide conditions for bacteria and fungi to work, the composting material should be kept moist, have access to oxygen, and be supplied with fertilizer high in nitrogen. The fertilizer furnishes the nutrients the soil organisms require for rapid growth. If the material used is largely leaves, straw, or other substances low in nitrogen, additional nitrogen will be needed to prevent excessive loss of bulk-since bulk is in part determined by the nitrogen level present.

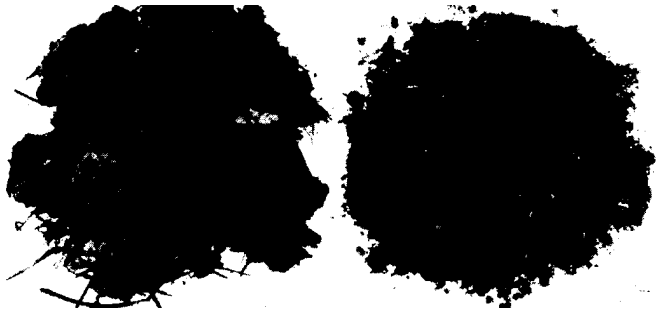

Figure 1. Left, organic roughage from compost pile built October 1974. The organic roughage (leaves, straw, etc.) has not lost its structure in August 1975. Right, compost from pile built two years earlier. The organic material has been reduced to compost without identifiable structure.

What goes on in the compost pile is a very complicated chemical and biological process, and various systems have been devised to shorten the time to produce compost and increase its value. These are mostly related to increasing the oxygen supply and supplying nitrogen. For practical purposes, building a compost pile is not an exact process. The usual practice is to accumulate the organic material in some out-of-the-way comer of the garden or other inconspicuous place. Fall is a convenient time to make a compost pile because leaves and refuse from the garden cleanup are available. The pile can be built on open ground or in a bin made of rough boards or stakes and small-mesh wire fencing. The sides of the bin should not be tight, because oxygen is essential for decay. To start a pile, part of the plant refuse is spread out in a layer six or eight inches deep. The pile should be large enough so that at least four or five layers can be made from the material available. A high nitrogen fertilizer of some readily available formula (10-10-10 for example) should be spread on each layer at the rate of about one-half pound or one cupful to each 30-35 square feet. If alkaline compost is desired, ground limestone may be spread on the pile at the same rate although usually this is not necessary. Sprinkling a few shovelfuls of garden soil over each layer will ensure the presence of decay organisms, but usually it is not needed.

The material in each layer should be moistened thoroughly. Successive layers are built in this way until all the plant refuse is used. Building the pile with a flat top that slants toward the center to catch rainfall is advantageous. Rapid decay usually will not occur until the following spring and summer. However, in a large pile not well moistened, undesirable heating may occur. -Ibis is indicated by the pile's giving off steam. This can be stopped by applying more water. In the following midsummer, decay can be hastened by forking over the pile and supplying water to parts that have remained dry. The compost will be ready for use at the end of the first summer season. It is an advantage to get it onto the land before it loses all its

structure. If uniform fine-textured material is wanted a longer time may be necessary. Compost should not be allowed to accumulate in the same place year after year because it may harbor rats.

Because the compost pile may sustain plant diseases, insects, and nematodes, obviously infected materials should not be included. Whether or not pests and diseases will persist in the compost will depend on the organisms present and the heat generated in the decay process. As a practical matter compost is spread on the garden without disinfestation. Compost is not recommended for growing seedlings because it may contain specific organisms that destroy them by causing damping off. Soil sterilization is not feasible for the amateur under present legal restrictions on the use of effective materials. For sowing seeds indoors a practical solution to the disease problems is to buy sterilized potting soil from the florist or garden store or use sterile materials such as the peat, perlite, and vermiculite mixes. (See *Flowers from Seed,* Cornell Information Bulletin 20).

The benefits of organic matter to the soil can be secured directly by using it as a mulch without composting, although uncomposted material is harder to handle and may be unsightly. Lawn clippings, leaves, and other fine material can be placed directly around shrubbery or on garden plots where appearance is not important. A discussion of the materials and methods of mulching is found in the Cornell Information Bulletin 37.

Any discussion of the compost pile would be incomplete without reference to the organic gardening movement that is currently receiving much attention. Insofar as organic gardening emphasizes the need for organic matter in soils and encourages soil conservation and the recycling of organic wastes, it is commendable. Promotion of a wellbalanced diet including vegetables and whole grains is to the credit of organic gardening. However, when fallacies and half-truths resulting from the interpretation of data or lack of adequate data are presented to the public, many of the beneficial effects of the publicity are lost. Some of the practices advocated are unnecessary, expensive, and misleading. Some of the gadgets that are devised and sold are nonessential and are not worth their cost.

One of the fallacies promoted by organic gardeners is that by composting wastes soil fertility in world food production will be maintained. Composting is a limited operation and cannot be relied upon to furnish economically the organic matter needed in soils over large areas. Crop rotations used in combination with chemical fertilizers are an essential part of maintaining the organic content of soils in such situations. Organic gardeners also claim that organic fertilizers are superior to chemical inorganic fertilizers. With very few exceptions, the organic combinations of elements must be reduced to some soluble inorganic form before they can be absorbed by plants again.

In organic gardening literature, emphasis is given to the claim that vegetables and other food products that have been fertilized with inorganic chemical fertilizers are harmful to human health in contrast to those in which the same elements were supplied from composted or other organic materials. This is exceedingly difficult to prove, and no results verify this claim despite much scientific work. Certainly existing evidence does not warrant payment of excessive prices for organic fertilizers or for foods that have been fertilized organically.

However, concentrated, quickly-available inorganic fertilizers must be used with greater caution than most organic materials because of the danger of applying too much, resulting in the direct injury to the plants. Also, if excessive amounts of nitrogen are applied over a large area, the wells and streams may be polluted. Many of the organic materials like bone meal, compost, and sewage sludge are slowly available

and rarely injure plants. On the other hand, fresh animal manures in direct contact with plants will cause injury.

Various aspects of composting are discussed in *The Biochemistry and Methodology of Composting,* Connecticut Agr. Exp. Sta. Bul. 727; *Ecology and Compost, N.Y.S.* College of Forestry, Syracuse, 1971; *Facts About Organic Gardening,* Cornell Information Bul. 36; and *Natural Gardening Handbook,* Brooklyn Botanic Garden Rec. 31(l).

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