Composting: Alchemy in Action

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You've heard of ancient alchemists trying to turn iron and sulfur into gold. They, of course, failed. Unlike these alchemists, you can change useless organic golf course trash and wastes like grass clippings, pine needles, paper, leaves and wood chips into good organic matter that is (almost) worth its weight in gold.

Composting today can be an efficient means of utilizing organic wastes in times of decreased open burning and general environmental concerns. It can tremendously reduce in volume golf course "wastes" and in fact can turn them into a product for use in top-dressings, mulches and general soil improvement. In this case, iron and sulfur (the wastes) can be changed into gold (the compost) quicker and easier than most people think.

WHY COMPOST?

There are three basic reasons why.

First, when a superintendent buys a commercially available peat for use on the golf course, he expects to get a material that is 100 per cent organic. But, as Figure 1 points out, peats can vary in their mineral content from 3.9 per cent ash (which is usually non-organic silt and clay) to 73.2 per cent ash . . . that is, peats can be from 96 per cent organic to only 27 per cent organic.

Figure 1. Variability encountered in organic amendments for topsoil mixtures.

Organic Material and Source	pH	% Ash (Non-Organic)
Sewage Waste (Calif.)	7.3	67.3
Muck—Peat (Ind.)	5.8	25.8
Muck—Peat (N.C.)	3.8	73.2
Moss Peat (Ore.)	4.0	3.9
Sedge Peat (Wis.)	6.0	12.8
Moss Peat (Ga.)	6.2	19.4
Lignified Wood (Calif.)	5.6	1.0
Rice Hulls (Tex.)	6.4	24.3
Cotton Gin Trash (Tex.)	8.3	43.3

So, if you can't find good organic matter, why not make your own so that you will know for sure exactly what you are using.

Second, almost every golf course superintendent composts in one form or another. Simply piling up leaves, as in Figure 2, and letting them rot is composting. It may be rather inefficient and may take years instead of months to decompose, but it is basic composting. Why not invest in the time and effort to make it faster and better? You may be pleasantly surprised at how easy it is to properly compost and how good the material is when you finish.

Third, like it or not, with more and more

Simply piling up leaves and letting them "rot" is composting. In this operation the pile on the near right is one year old, the pile on the left is two years old and the small pile center left is the usable compost three years old.

laws being passed restricting open burning, composting of golf course trash may be one of the best long-range alternatives left for getting rid of these wastes. What was previously burned must now be either stored in large out-of-the-way dumps, hauled away, or composted. In reality, composting is recycling of the first order and can work to your benefit in public relations, and in a well composted organic end product.

HOW DO YOU CONSTRUCT A COMPOST PILE?

Composting is simply the breaking down by small plants and animals (microbes) of complex organic residues into a simpler end product called compost. In this process the microbes do all the work; all we do is give them the proper environment for growth. The optimum conditions in the compost pile for rapid and unrestricted microbial growth are:

(1) Water. 50-70 per cent (moist but not soggy).

(2) Temperature. The compost pile generates its own heat, often up to 140-170°F., which in effect sterilizes the compost, but those piles started in the fall or winter when temperatures are cool will take longer to decompose.

(3) Nutrients. A carbon to nitrogen ratio (C:N) of 30-1 is optimum, because microbes use 30 parts carbon to 1 part nitrogen in their growth.

(4) Air. This is most important. Good aeration of the pile is essential for good microbial growth; when poorly aerated the process slows down and a foul odor is emitted.

If the pile is properly constructed, taking these factors into account, the microbial growth is rapid and the breakdown is completed to a friable, crumbly compost end product often in several months.

There are and have been many different ways of composting dating back to biblical times, like Luke's reference to "dunging the fig tree." In more recent times, beginning, believe it or not, with George Washington's writings of 1760, there have been various systems of composting. They all had the same thing in mind, i.e., doing everything possible to get good microbial growth for a rapid breakdown of the pile. Figure 3 illustrates what we think is one of the best methods of constructing a compost pile for golf course use. The pile consists of alternate layers of nitrogenous (wet and green) wastes three to four inches thick and carbonaceous (dry and light) material eight to nine inches thick. The piles should be at minimum three to four feet but not more than six to eight feet wide, and as long as space and ease of handling and turning dictate.

In the general category of wet and green (nitrogenous) wastes would be materials like grass clippings, weeds removed from bunkers or flower beds, bunker edgings and old or discarded sod from patchings or renovations.

The dry and light (carbonaceous) wastes would be materials like leaves, wood chips, paper, pine needles, thatch, etc. Mulching leaves before adding them to the pile is a good practice, since this greatly reduces their volume and increases the surface area for the microbes to work. A mulching, chipping, or shreading machine would be a good investment and a big help in any composting operation both in its preparation and final processing.

If the layers tend to become more dry and light than wet and green, it will be necessary to add some nitrogen to the pile. The decomposing organisms require nutrients to sustain their activity. Generally the addition of 10 to 15 pounds of actual nitrogen per dry ton of wastes in either an organic form or inorganic form should help overcome any nutrient deficiency and help speed the decomposition process along. In this case the fertilizer addition serves another purpose by helping it boost the nutrient content of the compost when the material is ready for use. If however, the pile is constructed as illustrated in the diagram, there should be no reason to add any fertilizer, because the carbon and nitrogen should be in about the desired 30-1 ratio. It is only when the dry and light materials are out of proportion to the wet and green that nitrogen needs to be added. Conversely, if the wet and green wastes predominate, then leaves, wood chips or sawdust must be added to bring up the C:N ratio in the pile.

One other point. It has been a practice for many years to add some lime to the pile to sweeten it. As it turns out, unless an acidifying fertilizer like ammonium sulfate is used, no lime is generally needed in the compost pile. If the pile is built with normal golf course wastes and if a 10-6-4 type of fertilizer is added to the pile, then the addition of lime is not needed. In fact, the across-the-board addition of lime will cause a serious tying-up of nitrogen needed by the microbes in the pile and may **slow down the decomposition process.** Therefore, use lime only when it is needed.

Once the pile is constructed, proper timing in turning the pile for moisture and aeration is all-important in the rapid completion of the decomposition process. With the pile constructed as illustrated, it should be turned once after three weeks and again every two to three weeks after that. If the pile needs water, it should be moistened (50-70 per cent moisture is optimum). A rainy day would be an excellent time for 'turning' as the pile is then re-moistened. Usually, this is one day when labor is available for such work.

It is difficult to say exactly how long it

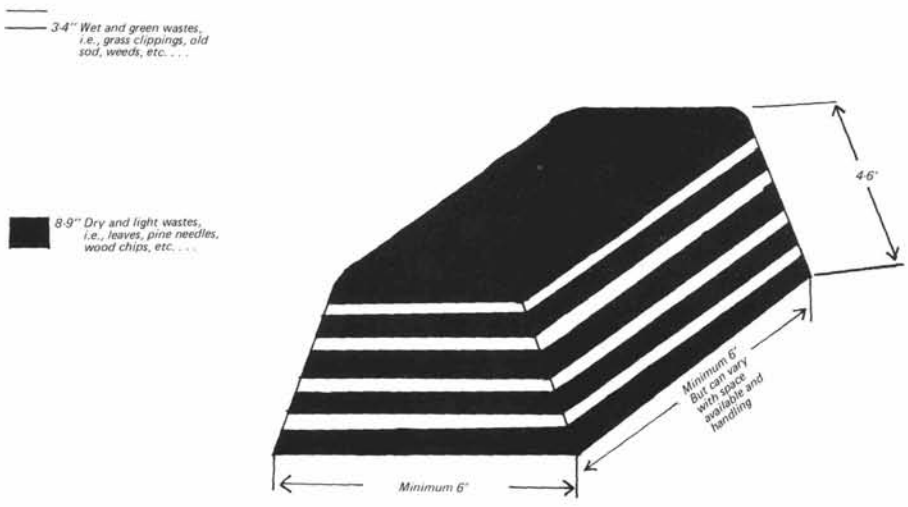

Figure 3.

takes a compost pile to decompose. This depends on proper moisture content; proper nutrient levels (not too much nitrogen and not too little in relation to the carbon present in the pile); proper temperature in the pile (which kills weed seed as well as pathogens); and proper aeration. All of these are interrelated and are essential for the proper decomposition of the pile. If the pile fails to decompose properly, one of these factors is probably limiting.

Interestingly enough, if all the needed elements of the pile are in the proper range and the pile is properly turned, the decomposition process will start and stop all by itself leaving us with a weed-free nutrient enriched compost.

WHAT ARE SOME USES FOR COMPOST?

Compost is nutrient-enriched organic material that has many golf course uses. Compost from an average golf course has a chemical analysis of from 1.5-3.5 per cent nitrogen, .5-1 per cent phosphorus, and 1-2 per cent potassium, averaging out about 2-1-1 overall, which is about that of dehydrated cow manure. This nitrogen-phosphorus-potassium is in a slow release form, and because it is derived from living matter, the compost also contains many trace elements essential for plant growth.

Perhaps more important than its value as a fertilizer is its value as a soil conditioner. In poor soils it improves soil structure, soil aeration, water-holding and nutrient-holding capacities. After being shredded and screened, it can be mixed with a good mason or brick type sand and used for topdressing greens. A good point to remember is, always topdress good greens with the same soil mixture that is already in them and topdress poor greens that can't be rebuilt with lighter and sandier blends. This avoids heavy soil layering on the good greens and helps to build up the poor greens.

Compost used for topdressing greens has other benefits besides being essentially weed-free organic matter. The compost is enriched with *both* nutrients and microbes. The nutrients give a slow gradual feed, and the microbes help break down thatch. As in composting, microbes do all the work in thatch decomposition. Periodic topdressings with this microbe enriched topdressing increases the surface area for them to work and can only increase the effectiveness of this operation.

Compost also makes an excellent material for preparing seedbeds, potting plants, mulching flower beds and new plantings of all types. All in all, there will probably be more uses for the compost than the amount that is available.

IN CONCLUSION

Composting is a practice that has generally fallen from our graces over the years. Waste disposal could be taken care of quicker and easier than by composting, but with the ever-increasing environmental pressure against open burning, among other things, perhaps the practice of composting should be reviewed to see if it can again be worked into your normal golf course routine. If properly done, the decomposition process is quicker and easier than most expect. Sometimes it is completed in only two to three months, and the composted end product has a wide range of important golf course uses.

The ancient alchemists tried in vain to turn iron and sulfur into yellow gold. Today, with a little time and effort, it is possible to change golf course wastes into gold . . . black gold.