Nature provides best compost formula

Pay attention to soil temperature, pH levels and nitrogen content.

by Paul D. Sachs

■ Soil temperature can have a profound effect on the rate of organic matter decomposition.

At a soil temperature of 88 degrees F, with adequate air and moisture, organic matter is destroyed faster than it can be produced. This is a common condition on tropical soils where high temperature, moisture from tropical rains, and an abundance of air from extremely sandy soils are all at an optimum level for bacterial decay.

Shading the soil can reduce soil surface temperatures and slow down the decomposition of organic matter. Turf stands, for example, that are mowed at maximum height during the hottest part of the year can shade the soil and reduce soil surface temperature by as much as 20 degrees. This is not always possible because of use restrictions, such as for golf greens and tees. However, in many instances a tall green stand of turf is much preferred over a short brown one.

Lime can significantly accelerate the decomposition process of humus. The low pH in acid soils inhibits the activities of bacteria. As the pH is raised by applications of lime, bacteria populations grow and a relative increase in decomposition activity occurs.

The right amount of lime can stimulate plant growth to a point where the production of organic residues is at its maximum level. However, excessive lime applications can create conditions too favorable for decay bacteria and hasten the destruction of organic matter at a pace greater than the plant residues can produce it. Chronological scheduling for lime applications without performing periodic pH tests can eventually lead to a significant loss of soil organic matter.

INFLUENCE OF TEMPERATURE ON SOIL ORGANIC MATTER CONTENT

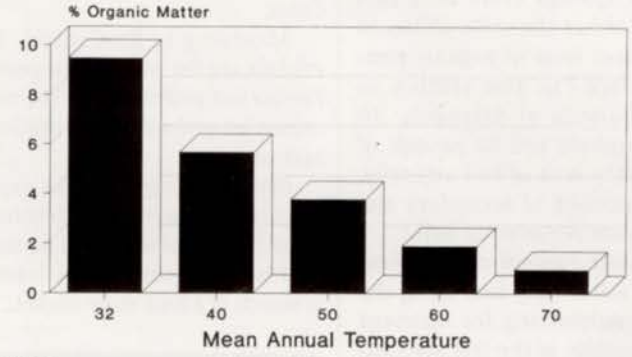

Figure 2

Measure nitrogen levels. Nitrogen is as vital to the development of decay bacteria as it is to the growth of plants. The ratio of carbon to nitrogen in an average soil is approximately 12:1. At this ratio, populations of decay bacteria are kept at a relatively constant level because there is not enough available soil nitrogen for a rampant population explosion. When large quantities of inorganic nitrogen are added to the soil, the bacteria populations are stimulated and they begin to decompose organic matter.

> Excess nitrogen can increase bacterial activity and deplete soil oxygen, resulting in slower root growth.

Stable humus is relatively resistant to further decomposition, when stimulated by added nitrogen, but younger, less decomposed material is not and may never evolve into stable humus if subjected to conditions that are conducive to quick and complete decomposition.

An increase in bacterial activity from excess nitrogen can also mean a depletion of soil oxygen levels which can inhibit root growth and cause slower production of organic matter. Lack of oxygen to the root systems can stress plants which can, oftentimes, increase its susceptibility to disease and insect problems.

Natural organic nitrogen is easier on soil organic matter because it is organic matter and provides energy needed by decay organisms in the form of carbon compounds. Inorganic nitrogen ignores the energy needs of soil organisms.

Producing organic matter.The largest producers of organic residues in turf grounds are the root systems. The roots of turf plants are essentially annual; every year a new root system emanates from the crown of the plant. It is estimated that 0.5 to 3 tons (dry basis) of organic matter can be added to an acre of soil every year from old roots systems, depending on how much mass accumulated from the previous year of growth.

Changing mowing height can have a profound effect on root growth and, consequently, on the production of organic matter. Roots are not fed directly by soil nutrients. Those nutrients promote top growth which, in turn, photosynthesizes energy for the roots. Obviously, the more leaf surface area exposed to the sun, the more energy will be synthesized by the tops for root production. According to Eliot Roberts, past director of The Lawn Institute, for every eighth of an inch the mowing height is raised there is a 30 percent increase in leaf surface area exposed to the sun. Other research from the institute shows root mass and soil penetration to increase exponentially as the mowing height is increased.

Bagged turf clippings can amount to another 0.5 to 3 tons per acre per year of organic matter on a dry basis. Recent research from the University of Connecticut suggests that leaving the clippings where they fall can improve the quality of turf and even suppress certain turf diseases.

Removing clippings every time turf is mowed diminishes the soil's ability to maintain a proper level of organic matter. This practice can also remove as much as 80 pounds of nitrogen, 20 pounds of phosphate and 60 pounds of potash from every acre of soil annually. A significant amount of secondary and trace elements are removed as well.

Organic matter content can be measured by most soil testing labs using the same samples submitting for nutrient analysis. The results of the test are usually expressed as a percent of soil content. Five percent is an ideal level but is not always practical to obtain. Under certain conditions, building organic matter levels to 5 percent might be impossible (e.g., in tropical soils).

Figure 2 shows that as the average annual temperature increases, the average level of soil organic matter decreases. This is not a maximum value that can exist in any given environment, but suggests that maintaining organic matter will become more difficult (not impossible) as we move closer to the equator.

Any attempts towards improving organic matter levels will usually cause an improvement in overall soil conditions and a significant reduction in the number of problems a land manager might encounter.

Paul Sachs is founder and president of North Country Organics, a Vermont-based manufacturer and supplier of natural fertilizers, soil amendments and environmentally compatible pest controls since 1983. His book, Edaphos: Dynamics of a Natural Soil System, *examines ways in which Sachs believes human beings are linked to the ecosystem, and how that link determines the future of civilization. To order* Edaphos, *call (802) 222-4277.*

Nematodes work against mole crickets at Florida resort town

PALM COAST, Fla.—Parasitic nematodes are being used in the fight against mole crickets at the Florida comunity of Palm Coast.

According to BioControl, Inc., mole crickets are the worst of the pests plaguing Florida turf professionals. The mole cricket causes an estimated $60 million in damages each year.

BioControl says it is the exclusive distributor of the nematodesolution. The spray consists of water and nematodes. The microscopic worms live at least 13 weeks in search of a host mole cricket.

> Researchers say the nematodes will live at least 13 weeks as they search for mole crickets.

"We are pleased to be a part of a very active movement toward environmentally integrated pest management," says Brigid Braun, superintendent at Matanzas Woods Golf Course in Palm Coast, where the nematode application was made on April 20. "We'll probably never be copletely free of pesticides, but biological control holds a lot of promise."

University of Florida entomologist Dr. Grover Smart developed and successfully field-tested the new species of insect parasites over a seven year time span. The University of Florida received a patent on the species in November of 1992.

BioControl, which has done work in nematode science since 1991, is the exclusive licensee of the University's nematode patent.

Callum Macgregor, president of BioControl, says the company has treated 65 golf courses and a dozen cattle pastures and several county school systems

"We expect to complete around 200 applications by the end of 1993," says Macgregor.

Bioturf News reported in July of the fight against the mole cricket. At the time, about five percent of Florida's 1200 golf courses were experimenting with nematode control. It is predicted that as many as 60 percent of the state's golf courses will be using some form of biological control in 10 years.

Nema-whats?

Nematodes are tiny roundworms that live in moist habitats.

Nematodes have diverse habits. Many are scavengers; some feed on fungus. Many are plant-parasitic and others parasitize various types of animals. Approximately 20 families of nematodes have insect-parasitic species. Nematodes can attack species within most orders of insects.

These nematodes search out insects, parasitize them, and then reproduce, resulting in more parasitic nematodes that will kill any additional insects they encounter.

Most insect-parasitic nematodes are harmless to other animals and do not attack plants.

Because of their small size and hidden nature, the benefits of naturally occuriring insect-parasitic nematodes are not always well understood.

Their benefit in the natural control of plant pests is greatest in areas of continuous moisture rather than in more arid areas.

Even in moist situations, however, they may not be abundant enough to provide significant pest suppression without other control augmentation.

EVENTS

December

12-15: American Entomological Society of America annual meeting, in the Indianapolis convention center.

Program includes information on advances in monitoring turf insects; using pheromones to manage turf insects; the host-plant resistance tactic, genetics and endophytes; and a look at the efficacy of milky spore.

New ways to use IPM technology will also be explained.