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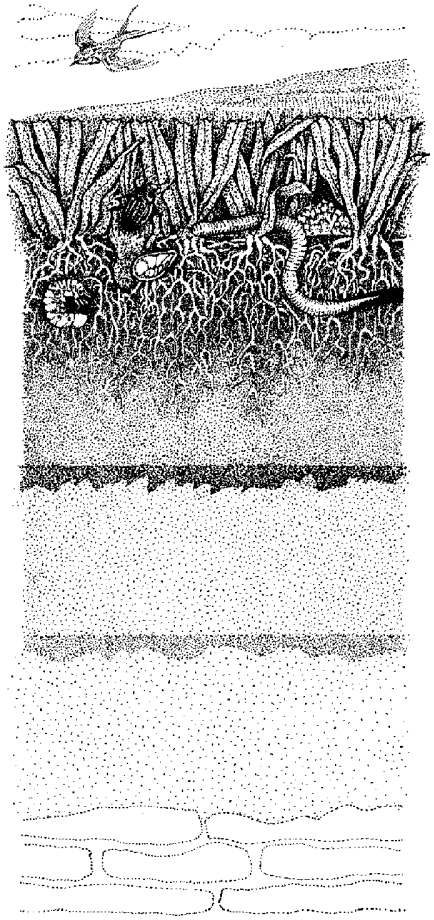

Composts As Soil Amendments

Compost is the product of biological decomposition of organic material in wastes under controlled conditions. An amendment is any material applied which alters the physical or chemical properties of a soil. Can compost be a suitable soil amendment when growing turfgrass? This is a question receiving more attention from turfgrass managers and researchers as alternatives to peat are sought and commercial production of composts increases. ■

Effect of Soil Characteristics

The ability of a soil to support a healthy stand of turfgrass is greatly influenced by inherent physical and chemical properties of the soil.

To properly manage turfgrass, it is important to understand soil characteristics and how they can affect growth and quality. Poor soil properties can lead to many problems, including inadequate drainage, reduced nutrient availability, soil compaction, and decreased microbial activity. This is particularly true of high traffic turf areas like golf greens and athletic fields which tend to be intensively used and managed.

When the physical shortcomings of a soil inhibit grass growth and ultimately the intended use of a turf area, modification by the addition of soil amendments may be called for to maintain adequate levels of oxygen, water, and nutrients. The appropriate amendment can improve plant growth, provide a better or safer playing surface, and reduce turf management problems. In a sandy soil, an amendment can increase the water holding capacity and ability to retain nutrients. On the other hand, a soil with too much clay can benefit from the addition of an amendment in order to reduce compaction and increase soil porosity.

The most common organic material used for soil modification is peat. Coarse-textured peat (such as sphagnum peat) can be used to modify fine textured soils and a finer, more decomposed peat (such as reed sedge or peat humus) is often used to modify coarser-textured soils. A number of benefits from the addition of peat have been recognized. Sandy soils amended with peat exhibit increased moisture holding capacity and fine-textured soils have better infiltration. Peat-modified soils have improved aeration and root penetration as well as increased nutrient retention and availability. Although peats are the

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Compost

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most common organic soil amendment, other composted materials are becoming increasingly available. How a compost compares with peat in its effect on soil physical and chemical properties will determine whether or not it is a suitable amendment.

Compost Suitability

The main factors that affect a compost's suitability as a soil amendment include maturity, nutrient availability, pH, water-holding capacity, and absence of toxic compounds. Since a variety of materials may go into a compost, the resulting compost can also be variable. Inconsistency in the final product is a problem inherent in the nature of compost. For example, yard waste composts may vary considerably due to the types of yard waste brought to the compost facility at different times of the year. Composts produced from sludge or food processing wastes tend to be much more consistent. To determine compost suitability, a sample should be sent to a soil testing lab. However, since you must make the final determination, keep the following in mind.

Topsoils are manufactured by blending soil, sand and compost.

A compost should be mature. Immature composts can interfere with plant growth through nitrogen immobilization and the temporary production of potentially toxic compounds like ammonia. Generally, a mature compost is dark-colored and has an earthy odor. Don't confuse compost maturity with compost quality. Maturity means the energy and nutrient containing materials have been combined into a stable organic mass. Quality reflects maturity but also reflects the chemical composition of the compost substrates. For example, an industrial sludge composted to maturity may contain a sufficient level of contaminants to be regarded as poor quality.

A soil testing lab can determine a compost's nutrient content. Don't treat compost as a fertilizer. Compost derived from high-nutrient substrates such as animal waste have relatively high nutrient availability. Compost derived from plant material is likely to be nutrient poor. Many of the nutrients are bound in organic compounds, unavailable to plants. As the compounds break down, a compost's real nutrient value is realized over the long term as substantial amounts of plant-available nutrients are released and the need for continued fertilization may be reduced.

The addition of compost to a soil has the important benefit of increasing the ability to retain nutrients. This quality is reflected by the cation exchange capacity, or CEC which measures negatively charged particles which attract positively charged nutrients. Addition of compost increases porosity which in turn increases aeration and reduces compaction. Water retention in the root zone is also increased in sandy soils.

Researchers at the University of Washington, Seattle, have established the *guidelines* shown in Table 1 for identification of high-quality compost. Keep in mind that higher or lower values don't necessarily mean the compost is inferior. On the other hand, some composts may meet these general criteria, but other properties make them unsuitable for plant growth. In the final analysis, compare a compost's properties to the use and effect you wish to achieve with it.

How Much to Use

Quality composts are a great means of increasing the organic matter content of soils. The addition of 10-30% (by volume) compost to a soil will increase the organic matter content by 2-5% by weight. This is ideally achieved through off-site mixing and screening, but can also be achieved by rototilling the compost into the existing soil. There are even some companies manufacturing "topsoil" by blending compost, sand, and soil together to produce rich sandy loams.

Composts can also be used as the organic component of sand based rootzones. The amount of compost needed is highly dependent on the properties of the sand and the design of the green

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Algae

Algae can be found in essentially all soils worldwide. Although in most turfgrass soils, the algae are a minor microbial component, their presence, under certain conditions, can create difficult management problems. Unlike the previously-mentioned groups of microorganisms, algae are capable of photosynthesis, allowing them to synthesize their own carbon compounds. Since algae require light, their presence in turfgrass plantings is often observed on the soil surface in sparsely seeded areas and in excessively close-cut turf such as on putting greens.

The types of problems caused by algae in turfgrasses include 1) the formation of surface crusts, 2) the production of copious slime, and 3) the formation of 'black layer'. The soil algae responsible for these problems can be classified into the green algae and the cyanobacteria (formerly referred to as blue-green algae). The genera of green algae recovered from turfgrasses include *Cosmarium, Coccomyxa, Cylindrocystis, Dactylothece, Mesotaenium, Klebsormidium,* and *Ourococcus*. All but the latter two are capable of producing surface crusts and slime. The two most abundant genera of cyanobacteria in turfgrasses include *Nostoc* and *Oscillatoria*. The latter genus has been implicated as the primary cause of slime formation on golf greens. The cyanobacteria are also known for their abilities to fix atmospheric nitrogen, which, in some instances, may actually contribute to the nitrogen nutrition of the turfgrass plant.

Algae are strictly dependent on adequate soil moisture for activity. Algal problems occur whenever the soil remains wet for prolonged periods of time and where the soil surface is exposed or the turfgrass stand is thin and weak. Although fertility has no clear relationship to algal activity, the use of acidifying fertilizers such as ammonium sulfate can enhance algal colonization.

Managing Microbial Resources

It is apparent that the soil contains an extremely rich wealth of microbial resources in addition to the harmful microorganisms with which we are familiar. Microbial communities in turfgrass soils influence all of the important processes related to plant nutrition and the general maintenance of plant health. Furthermore, soil microbial communities provide a genetic resource of potentially useful products and processes that can be exploited for the management of turfgrasses. The challenge to turfgrass managers is to become an expert, not only in the management of what everyone can see aboveground, but to master the management of soil microorganisms to achieve the maximum, sustainable means of turfgrass health and maintenance.

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or sports field. Therefore, thorough testing of mix ratios by a competent lab will be necessary.

While the benefits of using compost are well documented, use only *thoroughly* composted materials from known sources. Make an effort to find a source with a good track record for successful plantings. It will be time well spent.

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Table 1. Guidelines for identifying high-quality compost.

Physical Properties		Chemical Properties	
Color:	Brown to black	Organic Matter:	25 to 80 percent
Odor:	Earthy or mouldy	pH:	5.5-7.5
Moisture:	15-25%	Ash:	20-65%
Water-Holding Capacity:	150-200%	Nitrogen:	0.4-3.5%
Bulk Density:	0.2-0.6 g/cc	Phosphorus:	0.2-1.5%
		Potassium:	0.4-1.5%
		C:N Ratio:	25-30:1
		CEC:	50-150 meq/100 g