A CONTEMPORARY VIEW OF THATCH IN TURF

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A turf profile typically includes at least three identifiable zones, including: aerial shoots, thatch, and soil. Of these only the aerial shoot zone is composed entirely of living biomass, while the thatch and soil include both living and nonliving components. In newly established turfs, a thatch layer may be entirely absent, since the net accumulation of nonliving biomass, a probable precursor of thatch, has not yet developed. Following the accumulation of organic material at the soil surface, the living plant community responds by forming crowns, roots, and lateral shoots (rhizomes, stolons) within this medium. A thatch layer, composed of living and nonliving plant material, and located between the soil surface and aerial shoot zone, is thus formed. Due to its position within the turf profile and its relationship with the living plant community, the thatch is actually an important component of the growth medium of the turfgrass community. In some instances, growth of turfgrasses may be completely restricted to the thatch with virtually no roots or rhizomes extending to the underlying soil.

Thatch formation

Thatch forms when organic debris from the actively growing turf accumulates faster than it decomposes. According to studies at the University of Illinois and elsewhere, cultural or environmental factors that stimulate excessive growth or impair decomposition are conducive to thatch development.

The actual sequence of events leading to the formation of thatch is not clear. Presumably, a relatively stable layer of organic material accumulates at the soil surface from clippings, senescent leaves, and above ground adventitious rooting.

The turfgrass plants apparently respond by forming crowns, highly compressed stems at the base of aerial shoots, within this organic layer. (In a thatch-free turf, crowns form at or below the soil surface.) Adventitious roots and rhizomes emerge from mature sections of the crowns and start growing in the organic material.

Some of the crowns that develop in the thatch likely result from continued vertical growth of existing crowns. Others are formed by emerging rhizomes after they have been exposed to light and cease internode elongation. Since the thatch keeps light from penetrating to the soil surface, the internodes do not stop elongating until the rhizome terminal grows up to a level near the surface of the thatch.

As the older shoots and roots die, the crowns, roots and rhizomes may eventually grow mostly within the thatch, rather than in the soil (Fig. 2). Thus, where a substantial thatch has developed, it can constitute the primary growing medium for the turf grass plants while the underlying soil is of only secondary importance.

Thatch Characteristics

Thatch typically has a lower bulk density that either the underlying soil or the surface soil from a thatch-free turf. Since the soil underlying thatch contains few roots or rhizomes, it tends to be more compacted than thatch-free soils in which these organisms grow extensively. This illustrates the favorable effects of root and rhizome growth on soil physical conditions.

The thatch layer may contain appreciable amounts of soil. Much of the soil may have been carried by earthworms to the turfgrass surface during the spring and fall. In intensively cultured turfs, soil can also accumulate in the thatch as a result of topdressing, core cultivation, and vertical mowing operations. The effects of incorporating soil into the thatch are currently under study. According to preliminary results, the addition of soil apparently increases bulk density of the thatch substantially. The soil also reduces the mobility of surface-applied fertilizer nutrients and pesticides. Since thatch is typically regarded as an organic medium that is essentially devoid of soil, the inclusion of soil in thatch results in a "hybrid" entity with entirely different physical and chemical properties.

Physically, thatch is analogous to sand in that it has large pores. This property means that thatch has better aeration than most soils, as well as better resistance to compaction under traffic. However, the large pores readily lose water from drainage into the underlying soil and evapotranspiration into the atmosphere. An additional problem is that upward water movement stops at the thatch-soil interface, where the continuity of capillary pores is disrupted.

Importance of Thatch in Turfgrass Culture

Because of the poor water-holding capacity of the thatch, and also because of restricted rooting, thatchy turfs are especially prone to wilting during long drouths. When completely dry, thatch repels water and is extremely difficult to re-wet. Consequently, thatchy turfs need more irrigation than thatch-free turfs.

The frequent waterings required on thatchy turf tend to leach nutrients and pesticides through the thatch, so these materials have to be applied more often than on a thatch-free turf. Intensifying this need is the low nutrient storage capacity, or cation exchange capacity (CEC), of thatch. This low CEC does not show up if thatch is compared with soil on a weight basis. In fact, thatch samples had CEC measurements nearly twice those of equal weights of a silt loam soil. However, when these values were compared on an equal volume basis, the CEC of thatch was substantialy lower than that of soil.

Another problem associated with fertilization of thatchy turf occurs because soil-testing laboratories routinely discard the thatch before testing samples from turfgrass sites. Since most of the grass root system is in the thatch, the value of test results in determining fertilizer requirements is questionable. A valid test should include the thatch as part of the soil sample, or a separate analysis should be conducted for the thatch alone.

Pesticides applied to thatchy turf initially contact the thatch, rather than the soil. Thus, the mobility, metabolism and action of pesticides in thatch determine the efficacy, persistance, and selectivity of these chemicals. Attempts to characterize pesticide activity based upon studies conducted in soil media may lead to inaccurate conclusions when applied to turfgrass systems with thatch. Studies at the University of Illinois have shown that several preemergence herbicides are substantially more injurious to thatchy turf than to thatch-free turf. Laboratory studies have shown that these herbicides are more mobile in thatch than in silt loam soil. Thus, the herbicides are allowed to contact roots and rhizomes present in the thatch, but are held above these plant organs where they occur in soil in a thatch-free turf. This work has established two dimensions of turfgrass injury from preemergence herbicides: the inherent susceptiblity of turfgrasses to injury from herbicides that contact their roots and rhizomes, and the accessibility of these plant organs to surface-applied herbicides. For example, DCPA is an inherently safe herbicide. Even if it penetrates the root zone of a Kentucky bluegrass turf, little apparent injury results. Benefin, however, is an inherently injurious herbicide when allowed to contact turfgrass roots. In thatch-free turf, it is held above the root zone and, thus, causes no observable injury. Thus, the physical and chemical nature of the growth medium and the inherent susceptibility of plants to injury from specific herbicides together determine whether turfgrass injury will occur from herbicides applied to a specific site.

Thatch Control

In attempts to control thatch, various cultivation methods for extracting part of the organic debris without completely destroying the turf have been tried. These methods usually are not completely effective; they often injure the grass severely, and their beneficial effects may not last beyond one or two growing seasons.

However, one cultivation method, called coring or core cultivation, does alleviate soil compaction and improves infiltration in thatchy turfs. Small cores of soil are extracted to a depth 2 or 3 inches below the turf and are then dispersed and dragged into the turf, becoming part of the thatch layer. Although the thatch is not reduced uniformly through the turf, the thatch's physical and chemical properties are apparently modified. As a result, more moisture and nutrients are retained, and fewer fertilizer and irrigation applications are needed. Thus, this practice can conserve natural resources as well as improve turf quality.