

# The Thatch *problem*

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**Thatch harbors many microbes.** White areas in photo below show disease-causing fungus mycelia at work. Note the moldy appearance of the white patches.



THATCH has long been recognized as a problem on highly managed turfgrass areas. Golf course superintendents have aerified and top-dressed greens for many years. Part of the benefit from these management practices has been to control or at least reduce the ill effects of thatch buildup.

We might first answer the question "What is thatch?" Musser,<sup>1</sup> in his book *Turf Management*, has defined thatch as the accumulation of a dense felt of undecomposed dead roots and stems through which water cannot go down through. This definition applies to what I would consider advanced stages of thatch accumulation. Thatch accumulation, also called felting and matting, could perhaps result in adverse conditions for good turfgrass production before water penetration is completely eliminated. Wise,<sup>2</sup> in his text, *The Lawn Book*, has defined thatch as a layer of undecomposed stems, stolons, roots, and leaves that form between the soil surface and the visible green vegetation. Thatch may be thought of as dead plant parts between the soil and the crown of the growing plants. It is a continuing process beginning with the first minute formation of an organic layer and proceed-

<sup>1</sup>H. Burton Musser. *Turf Management*, McGraw-Hill Book Company, Inc.  
<sup>2</sup>L. N. Wise. *The Lawn Book*, Bowen Press, Inc.

- What it is
- What to do about it



**Top-dressing layers** are successively stratified in this thatch chunk. Layers show that during the war years no top dressing was applied; Later soil was aerified. Aerifying mixed the layers (see wavy lines) and gradually helped break up the layers where roots are now seen.

ing until in a few cases layers of thatch as thick as ten to twelve inches have been reported.

**Thatch Hinders Water, Minerals and Pesticides**

What effect does thatch accumulation have on turf quality? Thatch appears to hinder plant growth in many ways. Mineral elements applied on the surface are intercepted before they reach the soil. Because of this and other reasons, plant response to fertilization is impeded. Larger applications become necessary to meet needs for good plant growth and often increased fertilization will not correct the problem.

The undecomposed layer of dead plant parts creates a good environment where disease organisms and insects multiply and will thrive. This coupled with the decreased effectiveness of fungicides and insecticides caused by mat formation increases pest control problems manifold.

As mentioned by Dr. Musser in his definition of thatch, water penetration is greatly inhibited. It becomes necessary to apply larger and larger amounts of water to meet plant needs as thatch accumulates. Even with increased watering, the plant-water relationship leaves much to be desired.

The overall effect of thatch buildup is a turf low in vitality, easily subject to drought, and often affected by disease and other pests. The weakened turfgrass plant is easily injured by any stress conditions which may develop as a result of adverse environmental conditions.

**What Causes Thatch?**

Why does thatch develop? This is a question that will require much work if answered properly. Any condition that increases vegetative production and the subsequent death of plants or plant parts favors thatch development. Likewise, any factor that slows down organic decomposition favors matting. The real question thus becomes "What management practices may I use to reduce plant mortality and at the same time increase the decay of organic matter at the soil surface?"

Although most turfgrass species are perennials, an individual turfgrass plant does not live forever. Plants are continually dying and are being replaced. Many plant parts are replaced annually in the normal sequence of growth. The majority of roots of most perennial grasses die each winter, and new ones are

formed in the spring. All of this contributes to thatch buildup. In addition, management practices used to grow quality turf produce more plants and more vegetative growth per unit of area. This is one of the reasons why the worst thatch problems are found in turfgrass grown under high management systems.

Several factors are thought to contribute to decreased decay of thatch. Many of these factors, however, have not been substantiated by research. It is known that the microorganisms that decompose organic matter require high pH levels. Because of this, soil acidity has been listed as one cause responsible for matting. It should be mentioned that thatch problems have often been encountered on soils with pH levels near neutral (7.0). This does not necessarily mean that the pH level at the soil surface is neutral. Decomposition of organic materials results in acid conditions. Even though the soil pH may be high (alkaline), the pH level in the thatch layer could be quite low, or acidic. More research is needed to understand the relationship of pH to thatch accumulation.

Another factor often blamed



for thatch accumulation is the use of pesticides. It is thought that the use of pesticides may kill microorganisms that decompose organic materials. Thus, while one problem is being corrected another one may be added. As with pH, much research is needed to evaluate the effect of pesticides use on matting.

The process of decay ties up two materials necessary for plant growth. These are water and nitrogen. Insufficient amounts of either or both of these will contribute to felting. Oxygen is necessary for the growth of microorganisms. Poor soil aeration, therefore, may be expected to add to the thatch problem.

Grasses such as bermudagrass and zoysia are fibrous in nature and resistant to decay. Likewise, some plant parts are more resistant than others. Stems and roots decompose slower than leaf tissue.

One of the first management practices usually thought of in connection with matting is mowing. High and infrequent mowing has been reported to favor thatch buildup.

Along with mowing, returning grass clippings is often thought to be of primary importance in felting. Although clipped grass contributes to the total thatch problem, it is unlikely that it is one of the most important factors. As mentioned earlier, leaves decay faster than other plant parts. The fact that thatch problems exist in turfgrass where all clippings are removed is ample evidence that other factors are also important.

Once a layer of thatch has formed, conditions are improved for future accumulation. Each year as new roots are formed from the crown of the plant they must grow through the thatch layer to reach the soil surface. The following year many of these roots die adding to the organic materials already

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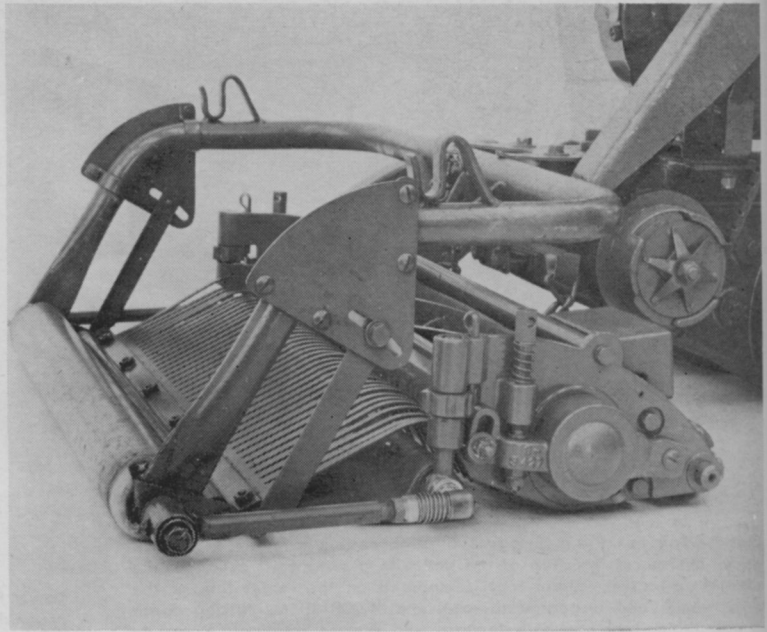
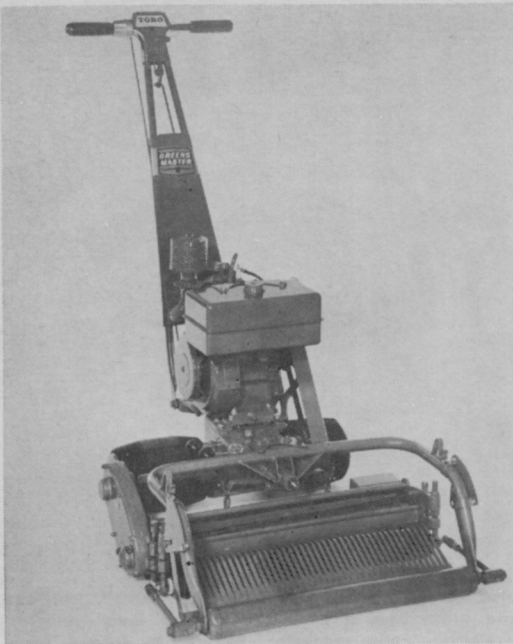
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**Delmonte Comb**, attached to a Toro Greensmaster 9-blade reel lawn cutter, lifts stringy grass blades up to cutting blades for an even mowing job. Flexible tongs of the comb are said to assure cutting at a uniform height and eliminate grain condition. Brush and roller attachments may be installed in place of the comb on the 21-inch mower frame. (Right) Closeup of Delmonte Comb. This is available from Toro Manufacturing Co.

present. Disease and insect infestations kill or damage an increasing number of plants again contributing to thatch buildup.

#### **Mechanical Control Recommended for Thatch**

What can be done to control thatch? Today most of the effort is toward mechanical control. The thatch layer is physically dug out by use of vertical mowers or other mechanical devices and removed by raking. There are three types of equipment available to do the job.

1. High speed—rigid blades—cuts whatever it touches.
2. Slow speed—rigid blades—combing and pulling action.
3. Slow speed—flexible blades—combing and pulling action.

Currently over 20 models from more than 12 manufacturers are designed to rake, comb, pull, or cut thatch from the soil surface. Most of these models do the job for which they are designed, however, it is important when purchasing renovating equipment to determine if the machine in question is designed to do the job you want it to do.

Soil aeration, although it does

not remove much of the thatch layer, often temporarily improves plant growth. An aerator used with equipment such as a vertical mower may be used for renovation.

Renovation or rejuvenation of most bluegrass or bentgrass areas should be done once per year. After considerable thatch has accumulated, it is difficult to remove without drastically injuring the turf. There should be green growing points remaining after the renovation is completed, otherwise brown areas



**Profile showing thatch** on top of a poor soil. Accumulation of organic matter like this acts as a thatch roof and prevents moisture and plant nutrients from moving down into the soil.

may be too severe and extensive. Inexperienced operators, on the other hand, are often afraid to remove enough thatch and vegetation. Removal of the thatch and up to 50% of the grass may be desirable.

#### **Renovation Program Should Include Fertilization**

On bluegrass and bentgrass renovation is most often done in the fall. Spring is also an acceptable time provided the job is completed very early. Fertilization is generally favored at the same time.

On golf greens, topdressing with soil is often used. If a thatch layer has already developed, top dressing will not eliminate the problem. Vertical mowing and aeration followed by top dressing is usually necessary.

In summary:

(1) Thatch is a real problem and has often increased in spite of good management;

(2) Much more information is needed about the effect of management on thatch accumulation, and

(3) Mechanical renovation is recommended.