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Thatch Prevention and Control

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Thatch is a layer of dead and decaying organic matter between the soil surface and the base of the turfgrass plant. Under ideal conditions, soil microorganisms break down this organic matter before it has a chance to accumulate and form a thatch layer. Thatch accumulation occurs when plant production exceeds breakdown. Excessive thatch accumulation has negative consequences that can affect the turf and soil environment.

How Do You Determine When There Is Too Much Thatch?

A good way to determine thatch accumulation is to take a knife or spade and cut a wedge-shaped piece from the lawn (Figure 1). The sample should be cut deep enough to reach the soil. The thatch layer is the layer of organic material between the soil surface and the base of the turfgrass plant.

Take-Home Points

- Thatch is a layer of dead and decaying organic matter between the soil surface and the base of the turfgrass plant.
- A thatch layer greater than 0.5-inch deep will prevent air, water, fertilizer and pesticide movement into the soil.
- Proper mowing, fertilization, irrigation and soil pH will reduce thatch accumulation.
- Thatch can be removed by vertical mowing and core aerification.
- Taking a proactive approach to promote organic matter decomposition will not only reduce thatch accumulation and inputs by the homeowner but will ultimately promote a healthier lawn.

Figure 1. A zoysiagrass soil profile showing less than 0.5-inch thatch accumulation (left) compared to zoysiagrass soil profile showing 2.0 inches of thatch (right).

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Identifying when thatch depth becomes too deep is not as simple as one might think. In athletic fields or areas with large amounts of traffic, thatch is beneficial because it can protect the plant from wear and reduce soil compaction. Thatch can also provide a cushion for the athletes, ultimately reducing the occurrence of injuries in contact sports. However, thatch buildup is generally undesirable in the home lawn. A thatch layer greater than 0.5-inch deep will lead to problems in home lawns, whereas a thatch layer between 0.5- to 1.0-inch deep would be acceptable on athletic fields.

Although turfgrass species differ in their ability to produce thatch, 0.5 inch of accumulation in home lawns is normally considered a good point to begin actively maintaining the thatch. Turfgrass species that spread by both rhizomes and stolons, such as bermudagrass and zoysiagrass, are the most prone to accumulate excessive thatch layers (Table 1). Other grasses such as St. Augustinegrass and centipedegrass only spread by stolons but can still create layers of thatch that are undesirable. Grasses with a bunch-type growth habit, such as tall fescue, do not normally produce thatch.

Table 1. Tendency to produce thatch for turfgrasses grown in Arkansas.

High	Medium	Low
Bermudagrass Zoysiagrass	Kentucky bluegrass Centipedegrass St. Augustinegrass Creeping bentgrass	Tall fescue Perennial ryegrass

Turfgrass species selection can influence thatch buildup, but the greatest contributor to thatch buildup is improper cultural practices performed by some homeowners. Too much nitrogen fertilization can increase plant growth to a point where soil microorganisms cannot break down organic matter fast enough. Poor soil conditions, such as an extreme pH (too low or too high), soil compaction, excessive irrigation or poor drainage, can also negatively impact soil microorganisms necessary to break down thatch. Microorganisms prefer a soil pH near neutral (pH = 7.0) and are most active in soils with good aeration, good drainage and adequate soil moisture.

Clippings Do Not Cause Thatch

In the 1960s, it was commonly believed grass clippings were a major component of thatch and removing clippings dramatically slowed thatch development. In 1967 researchers at the University of Rhode Island completed and published a detailed study of thatch, showing it was primarily composed of lignin-containing tissues (rhizomes, stolons and stems) as well as living turfgrass roots. They concluded leaves and clippings do not contribute to thatch buildup. Their findings were confirmed in numerous other studies. Thatching tendency in zoysiagrass is only increased by 3 percent from returning clippings, which is likely the result of the nutrients added from recycling clippings. Research with bermudagrass also confirmed that clippings do not contribute to thatch buildup. For more information about mowing, see *Mowing Your Lawn*, FSA6023.

Why Is Thatch Buildup a Problem?

Excessive thatch buildup can negatively impact a lawn. A thatch layer beyond 0.5 inch can result in the growing points of the plant (crown, rhizomes and stolons) becoming elevated, making them more susceptible to winter and mowing injury. Thatch can prevent air, water, fertilizer and pesticide movement into the soil, often resulting in greater inputs by the homeowner with fewer results. Shallow rooting can occur if thatch accumulates excessively because turfgrass roots will begin to grow in the thatch and not in the soil. In some cases, excessive thatch buildup can act as a haven for turfgrass pests such as diseases and insects. More immediate consequences such as scalping and poor mowing quality can be observed when thatch becomes excessive as elevated plant parts become exposed to mower blades. Mower wheels can also sink into the thatch layer resulting in an unsightly, irregular cut.

How Can a Homeowner Prevent Thatch?

Prevention is the best tool to limiting thatch buildup in home lawns. Proper cultural methods are the keys to prevention of excessive thatch buildup. Too much N fertilization will cause excessive growth and encourage thatch production. Maintaining adequate fertility for home lawns is the first step in prevention and is oftentimes the most neglected. Since grass species require differing amounts of fertility, it is important to determine how much nitrogen fertilizer your lawn will need (Table 2). For more information about fertilizing. See *Fertilizing Your Lawn*, FSA2114.

Deep and infrequent irrigation can help promote proper root growth and still provide a favorable environment for soil microorganisms. Regular mowing is also a simple way of preventing thatch buildup. Although grass clippings do not contribute to thatch accumulation, large amounts of clippings left on a lawn can tie up soil microorganisms and keep them from decomposing lignin-containing plant parts.

Table 2. Nitrogen fertilizer recommendations for Arkansas lawns.

Lawn Turf	Amount of N to Apply	Application Timing
	lb N/1,000 ft^2/year	
Warm-season grasses		
Bermudagrass	3-5	May-September
Centipedegrass	1-2	June-August
St. Augustinegrass	1-3	June-August
Zoysiagrass	1-2	June-August
Cool-season grasses		
Tall fescue†	2-4	April, September, November

†Kentucky bluegrass, hybrid bluegrass and perennial ryegrass should be fertilized with similar quantities and timings.

Turfgrasses also grow well at soil pH levels that encourage microbial growth. Each turfgrass species prefers a slightly different pH for optimum growth, but most prefer a soil pH in the range of 5.8 to 7.0. The pH scale ranges from 0 to 14. A pH of 7.0 is neutral. Values less than 7.0 indicate acid conditions, while readings over 7.0 indicate alkaline conditions. Most lawns in Arkansas are grown on acidic soils and require occasional liming. Correcting an inadequate soil pH will improve microbial activity and reduce thatch. For more information about soil pH in lawns, see *Liming Your Lawn*, FSA6134.

Soil aeration (soil air) is decreased when soils are compacted from heavy traffic or over-irrigation. Decreased soil aeration will result in decreased microbial activity. Correcting irrigation practices as described above and decreasing soil compaction by core aerification can help improve microbial activity and reduce thatch buildup in lawns.

Use pesticides only when needed. Some pesticides can have a negative impact on soil fauna such as earthworms and microbes. Microbes and earthworms are the two most effective organisms at reducing thatch. Earthworms eat organic matter such as thatch and break thatch down through digestion. Earthworm activity in lawns should be encouraged through good cultural practices and reduced pesticide use because they are effective at breaking down thatch, aerating soils and mixing soil into thatch.

How Can a Homeowner Remove Thatch?

Vertical mowing is the most common method homeowners use to reduce thatch. It is performed with a specialized device that has blades that cut perpendicular to the soil surface as opposed to the parallel direction of traditional mowers. Bermudagrass and zoysiagrass should be dethatched when actively growing in the early summer. This will ensure quick recovery, since warm-season grasses grow rapidly during early summer. Kentucky bluegrass should be dethatched in the spring (April) or fall (Sept.) when it is actively growing and never in the summer. Tall fescue and perennial ryegrass rarely develop a thatch problem because of their bunch-type growth habit.

Vertical mowing is a labor-intensive practice, so make sure you are willing and that it is necessary before attempting this task. Additionally, vertical mowing results in a tremendous amount of material that must be raked and removed. This material should be composted rather than bagged and taken to a landfill.

Core aerification is unique in that it provides both thatch removal and soil cultivation. Aerification cultivates the soil, reducing compaction, removing thatch and providing faster water, air and nutrient movement into the soil. Aerification can also be used in conjunction with soil topdressing, another method commonly used to reduce thatch by golf course and sports field managers. The extracted cores can be left on the surface and eventually broken up by mowing to act as a topdressing material. Adding soil amendments such as a compost or topsoil through light topdressing (0.25 inch) can be an effective method for decreasing thatch and increasing the overall decomposition rate. Increased equipment, material and labor cost, however, make topdressing not very feasible for most homeowners. Core aerification and topdressing can be done throughout the year, but they tend to be most successful when the turf is actively growing.

Core aerification is most beneficial when the largest tines or spoons available are used, penetration is 2 to 3 inches deep and when 20 to 40 holes are punched per square foot. Aerifiers with reciprocating arms are the most effective, whereas the aerifiers that roll behind garden tractors are less effective because they do not penetrate deep enough nor punch enough holes per square foot. Some aerifying

Table 3. Percent of surface area impacted by various aerifier tine sizes and spacings.

Internal Tine Diameter (in.)	Tine Spacing	Number of Holes/ft^2	Percent Surface Area Affected
0.50	3" x 3"	16	2.2
0.50	2" x 2"	36	4.9
0.75	3" x 3"	16	4.9
0.75	2" x 2"	36	11.0
1.00	3" x 3"	16	8.7
1.00	2" x 2"	36	19.6

machines available at rental agencies may not punch enough holes per square foot, thus multiple passes will be needed to achieve the 20 to 40 holes/ft^2 (Table 3). The same is often true with aerification services provided by lawn care operators.

Other Practices

Power-raking is another method similar to vertical mowing. A power rake is a device that uses flexible wires to scrape through the turf canopy to loosen and remove debris. It can be effective at removing and loosening debris, but it usually is ineffective at removing a large amount of thatch.

Spiking or slicing is another soil cultivation method purported to decrease thatch. However, practices such as slicing or spiking remove no soil and do not effectively reduce thatch although they are beneficial for improving water infiltration.

Scalping is one more method purported to decrease thatch. It is a process of mowing lower than the optimum height of cut in order to thin out the stand. Scalping is not effective at reducing thatch.

Final Thoughts on Controlling Thatch

As a homeowner, it is important to understand what thatch is and how it can become a problem. Taking a proactive approach to promote organic matter decomposition will not only reduce thatch accumulation and inputs by the homeowner but will ultimately promote a healthier lawn.

References

1. Carrow, R.N., D.V. Waddington, and P.E. Rieke. 2001. *Turfgrass Soil Fertility and Chemical Problems: Assessment and Management*. Sleeping Bear Press, Chelsea, MI.
2. Ledeboer, F.B., and C.R. Skogley. 1967. Investigations into the nature of thatch and methods for its decomposition. *Agron. J*. 59:320-323.
3. Meinhold, V.H., R.L. Duble, R.W. Weaver, and E.C. Holt. 1973. Thatch accumulation in bermudagrass turf in relation to management. *Agron. J*. 65:833-835.
4. Soper, D.Z., J.H. Dunn, D.D. Minner, and D.A. Sleper. 1988. Effects of clipping disposal, nitrogen and growth retardants on thatch and tiller density in zoysiagrass. *Crop Sci*. 28:325-328.

Additional Information

Additional fact sheets available at http://publications.uaex.uada.edu/.

Additional information about turfgrass management is available at http://turf.uark.edu/.

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