DR. JAMES B. BEARD

TURFGRASS RESEARCH REVIEW

NITROGEN CONTRIBUTES TO THATCH ACCUMULATION

Thatch accumulation in bermudagrass turf in relation to management. *V. H. Meinhold, R. L. Duble, R. W. Weaver and E. C. Holt. Agronomy Journal. 65(5): 833-835. 1973. (from the Soil and Crop Sciences Department, Texas A&M University, College Station, Tex. 77843).*

The objective of this investigation was to determine the effects of fertility, fungicide and clippings on thatch accumulation in a Tifgreen bermudagrass turf. The experiments were established on a mature turf that had been maintained under putting green conditions. A split plot design with three replications was utilized.

The three main plot treatments consisted of (a) alternate fungicide applications of Fore and Tersan OM applied at two week intervals, (b) regular mowing with clippings returned and (c) clippings removed but no fungicide applied. Subplot fertilizer treatments were then superimposed over these three main plot treatments. Included were (a) two nitrogen sources (ammonium sulfate and activated sewage sludge) each applied every two weeks at 0.5 and 1.5 pounds per 1,000 square feet and (b) potassium chloride applied every four weeks at rates of 0 and 1.5 pounds per 1,000 square feet. The duration of the experiment lasted from May 15 to October 23.

The effects of various cultural practices were evaluated by measuring (a) total thatch accumulation, (b) lignin content of the thatch, and (c) soil microbial activity. Total thatch accumulation was determined by taking eight random plugs from each subplot and physically measuring the depth of the thatch layer. Chemical analyses of lignin content were made three times during the experimental period on two inch diameter plugs. The soil microbial activity was measured on one-inch diameter soil plugs taken from the individual plots. The live vegetation was killed with cacodylic acid prior to measurements of carbon evolution. Finally visual ratings of turfgrass quality were made, particularly of color and scalping tendency.

Results of this study reveal that the higher nitrogen level increased thatch accumulation by 30 per cent and the lignin content of the thatch by 15 per cent. At the same time, the higher nitrogen levels resulted in reduced microbial activity compared to the lower nitrogen level. In comparing the two nitrogen sources utilized in the study, the activated sewage sludge decreased thatch accumulation and lignin content and at the same time increased microbial activity compared to the effects of the ammonium sulfate treatments. Differences between nitrogen sources were attributed to differentials in the rate of nitrogen release which in turn affected the shoot growth rate. The two potassium levels had no effect on thatch accumulation, lignin content or microbial activity. The lack of a potassium response could be partly attributed to the adequate soil potassium levels already existing on the experimental site at the time the experiment was initiated.

The fungicide program decreased thatch accumulation by 16 per cent and the lignin content by 20 per cent whereas the microbial activity increased by 30 per cent. The fungicide treated plots were not as dark green as the other plots and were not as prone to scalping. The authors attributed the reduced thatch accumulation to a fungicidal inhibition of shoot growth.

Those cultural treatments that produced the greatest thatch accumulation and highest lignin content also had the lowest rates of carbon evolution. The return of clippings did not influence the quantity of accumulated thatch. However, thatch accumulation and rate of shoot growth were enhanced where clippings were returned. Scalping was also more severe where clippings were returned. This was attributed to the greater shoot growth rate resulting from the recycling of nitrogen in the clippings. The authors concluded that slow release forms of nitrogen applied at a level to maintain acceptable turfgrass quality, but avoiding excessive shoot growth rates, may be utilized to reduce the thatch problem.

Comments: Thatch is defined as a tightly intermingled layer of dead and living stems and roots that develops between the zone of green vegetation and the soil surface. Thatch accumulation occurs when the rate of shoot growth and resultant dry matter accumulation above the soil surface exceeds the rate of organic matter decomposition. Thatch usually has a higher lignin content because this compound is very resistant to decomposition.

Thatch that accumulates to an excessive degree has many undesirable characteristics which far exceed the benefits. Specific difficulties associated with excessive thatch accumulation include (a) increased proneness to scalping, (b) enhanced disease development and insect problems, (c) proneness to localized dry spots, (d) chlorosis or yellowing, (e) foot-printing and reduced putting quality and (f) reduced heat, cold, and drought hardiness. A limited amount of thatch

continued on page 22

BEARD *from page 18*

does provide certain beneficial effects. Included is a cushion that is desirable on greens to provide resiliency for proper ball bounce. This limited quantity of thatch also results in increased wear tolerance and more insulation against soil temperature extremes.

This study shows the striking importance of nitrogen nutrition in affecting the rate of thatch accumulation. The primary effect of nitrogen is in the stimulation of shoot growth which in turn increases the rate at which a thatch problem develops on a given turf area.

This investigation also stresses the great nutritional value of clippings. The plots where clippings were returned were much darker green, produced a greater quantity of shoot growth, greater thatch accumulation and an increased scalping tendency. This is a direct response to nitrogen comparable to that of the two nitrogen rates. In effect, there were three levels of nitrogen utilized in this study.

In addition to excessive nitrogen nutritional levels, other factors contributing to thatch accumulation include (a) vigorous growing turfgrass cultivars, (b) infrequent or excessively high mowing, (c) acidic soil conditions, (d) poor aeration and (e) lack of beneficial thatch decomposers such as earthworms, fungi and microorganisms. Cultivar, nitrogen level, mowing practices and control of earthworms are probably the major factors affecting the thatch accumulation rate. Thus, they are the most readily manipulated in controlling the rate of thatch buildup.

The effects of fungicides on the rate of thatch accumulation are not well known. This is one of the first studies suggesting some of the types of responses that may occur. A total understanding of the effects of fungicide cannot be developed until a wide range of the commonly used fungicides can be evaluated under many different cultural conditions. Much more work of this type is needed. It should be pointed out to those readers acquainted only with bentgrass greens, that bermudagrass has a greater and more rapid thatching tendency than bentgrass. This is illustrated by the results obtained during the relatively short time that the experiment was conducted. This research was conducted under a grant from the O. J. Noer Research Foundation. □