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Research conducted at the University of Georgia's Coastal Plain Experiment Station in Tifton investigated the efficacy of the Graden verticutter in an integrated program including varying levels of nitrogen fertilizer and a lable rate of Primo (trinexap-ethyl) to control thatch in 'TifEagle' bermudagrass. It is hoped that this research can help lead to best management practices that can be the basis for good thatch management (left) compared to detrimental excessive thatch accumulation (right).

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PURPOSE

The purpose of *USGA Turfgrass and Environmental Research Online* is to effectively communicate the results of research projects funded under USGA's Turfgrass and Environmental Research Program to all who can benefit from such knowledge. Since 1983, the USGA has funded more than 225 projects at a cost of $25 million. The private, non-profit research program provides funding opportunities to university faculty interested in working on environmental and turf management problems affecting golf courses. The outstanding playing conditions of today's golf courses are a direct result of ***using science to benefit golf***.

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Controlling Thatch in 'TifEagle' Bermudagrass with the Graden Verticutter

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SUMMARY

It is essential that excess thatch is prevented on golf greens using 'TifEagle' and the other ultradwarf bermudagrasses. Some of the established methods for managing thatch on greens are aeration, light topdressing with sand, light verticutting, grooming, and no more N fertilization than necessary. Deep verticutting is occasionally necessary if thatch accumulates to a detrimental level. Principles observed for managing thatch in this study can be applied to high sand greens, but direct application may not give the same results because the study was conducted on a native soil. In this study we evaluated the effects of saw blade widths of the Graden verticutter, nitrogen (N) level, and Primo (trinexapac-ethyl) on turf quality. The research findings in this two-year showed:

- There were differences in the amount of thatch removed by the different saw blades widths, but blade width appeared to have little effect on overall turf quality.
- It took about 6 weeks to fully recover from a deep verticutting with the Graden verticutter.
- The Graden verticutter effectively removed thatch.
- Plots receiving Primo tended to recover faster than those not receiving Primo.
- Plots receiving no thatch removal treatment deteriorated quickly in the second year, even though sand was applied.

Thatch development, prevention, and management are some of the major concerns for growing high quality 'TifEagle' (1) and the other ultradwarf bermudagrasses. Uncontrolled thatch will: 1) hinder moisture, air, fertilizer, and water from moving into the root area resulting in poor plant growth and unhealthy plants, 2) result in scalping, and 3) increase winterkill. It is recommended that managers initiate a plan for preventing detrimental thatch (although some thatch is desirable) beginning on the day that the grass is planted. Waiting a year or more to initiate a thatch-control program can result in too much thatch which usually requires some major thatch removal and "down time" on the greens.

Aeration, vertical mowing, topdressing, brushing, and grooming are traditional methods used to control thatch in golf greens (2, 3, 4, also see **www.tifeagle.com.**). The introduction of the Graden verticutter which uses saw blades in 1/8, 1/10, and 1/16-inch thicknesses appear to offer a more friendly approach to removing thatch in the ultradwarfs. However, there was little information on using this piece of equipment on the ultradwarfs. Our objective was to initiate experiments

Figure 1. Larry Baldree operating the Graden verticutter to remove thatch in 'TifEagle'.

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	Turf Quality[a]			Turf Color[b]	
	2001	2002	2003[c]	2001	2002
Blade width					
1/8-inch	6.0	7.0	5.1	7.3	8.1
1/10-inch	6.3	7.1	5.0	7.2	8.1
1/16-inch	6.4	7.1	4.8	7.5	7.9
Control	7.7	7.1	2.5	7.6	6.9
Nitrogen					
1/4 lb	6.0	7.1	6.1	6.3	7.0
1/2 lb	7.2	7.0	2.6	8.5	8.2
Primo					
No Primo	6.4	7.1		7.0	7.7
Primo	7.0	7.0		7.8	7.8
LSD[d]					
Blade width	0.3	0.4	0.8	0.2	0.3
Nitrogen	0.2	0.2	0.6	0.2	0.2
Primo	0.2	0.2		0.2	0.2

[a]Turf quality was rated on a subjective 1-9 scale where 9=best and 1=dead turf.

[b]Turf color was rated on a subjective 1-9 scale where 9=dark green and 1=straw colored brown.

[c]One date rated (March 7, 2003).

[d] LSD represents least significant differences. Differences between treatment means greater than this amount are deemed significantly different (due to treatment) at the 0.05 level of significance.

Table 1. Mean turf quality and color in response to Graden mower blades, nitrogen level, and Primo in 2001 and 2002..

using the Graden verticutter for controlling thatch in 'TifEagle' bermudagrass maintained at putting green height in 2001 and 2002.

Experimental Procedure

A 36 ft. X 75 ft. block of established 'TifEagle' growing on a sandy loam soil in our turf plot area at Tifton, GA was used. The 1/8-inch blades came on the Graden unit and the company donated the 1/10 and 1/16-inch blades. Ammonium nitrate was applied at rates of 1/4 and 1/2 lb. N/1000 sq. ft. every two weeks to 18 ft. X 75 ft. blocks, respectively. Plots (blade width treatments) in each block were 4 ft. X 18 ft. On April 17, 2001, we verticut at a 1/4-inch depth. On August 28, 2001 and June 6, 2002, we verticut at a one-inch depth because the 1/4-inch depth did not remove enough thatch (Figure1).

Primo (trinexapac-ethyl) at the rate of 0.10 oz. per 1000 sq. ft. was applied on June 29, August 7, and Sept. 7, 2001 and on April 18, May 17, June 13, July 18, and August 15, 2002 to a six-feet-wide strip across each blade treatment. Plots (including the control plots with no thatch removal) were lightly topdressed with sand every two weeks. Treatments were replicated four times.

	Thatch Thichness			Organic Matter Removed[a]	
	2001[b]	2002[b]	2002[b]	2001[c]	2002[c]
	----------(mm)----------			----------(grams)----------	
Blade width					
1/8-inch	33	6	9	1904	108
1/10-inch	39	7	13	1343	300
1/16-inch	32	5	10	1174	289
Control	32	12	35		
Nitrogen level					
¼ lb.	29	8	16	1488	219
½ lb.	39	8	17	1460	246
Primo					
No Primo		5	18		248
Primo		5	18		216
LSD[d]					
Blade width	3	4	3	161	27
Nitrogen	4	2	3	196	22
Primo		2	3		22

[a]Organic matter removed from uniform area within each year (Non-dried in 2001; dried in 2002.

[b]Thatch thicknesses were measured on August 3, 2001, June 6, 2002, and November 11, 2002.

[c]Organic matter removed was measured on August 28, 2001 and June 6, 2002.

[d] LSD represents least significant differences. Differences between treatment means greater than this amount are deemed significantly different (due to treatment) at the 0.05 level of significance.

Table 2. Thatch characteristics in the Graden verticutter study in 2001 and 2002.

Results and Discussion

First Year

During the first year of the experiment, overall turf quality was higher for the non-verticut plots, plots receiving 1/2 lb. N/1000 sq. ft., and plots receiving Primo (Table 1). The Graden mower significantly reduced the quality of the turf and it took at least six weeks to recover (data not shown) from both the April 17 and August 28 verticutting. Recovery was somewhat quicker in plots receiving Primo. A higher application of soluble nitrogen (not applied in this study) before verticutting may have helped speed up recovery time of the turf. At least 1/2 lb. N/1000 sq. ft. was needed every two weeks to maintain acceptable turf quality.

Plots receiving 1/2 lb. N/1000 sq. ft. and/or Primo had significantly better color than remaining plots. The thatch layer was twice as thick for the 1/2 lb. N/1000 sq. ft. treatment compared to the 1/4 lb. N/1000 sq. ft. treatment at the end of the first year (Table 2). The thatch layer on

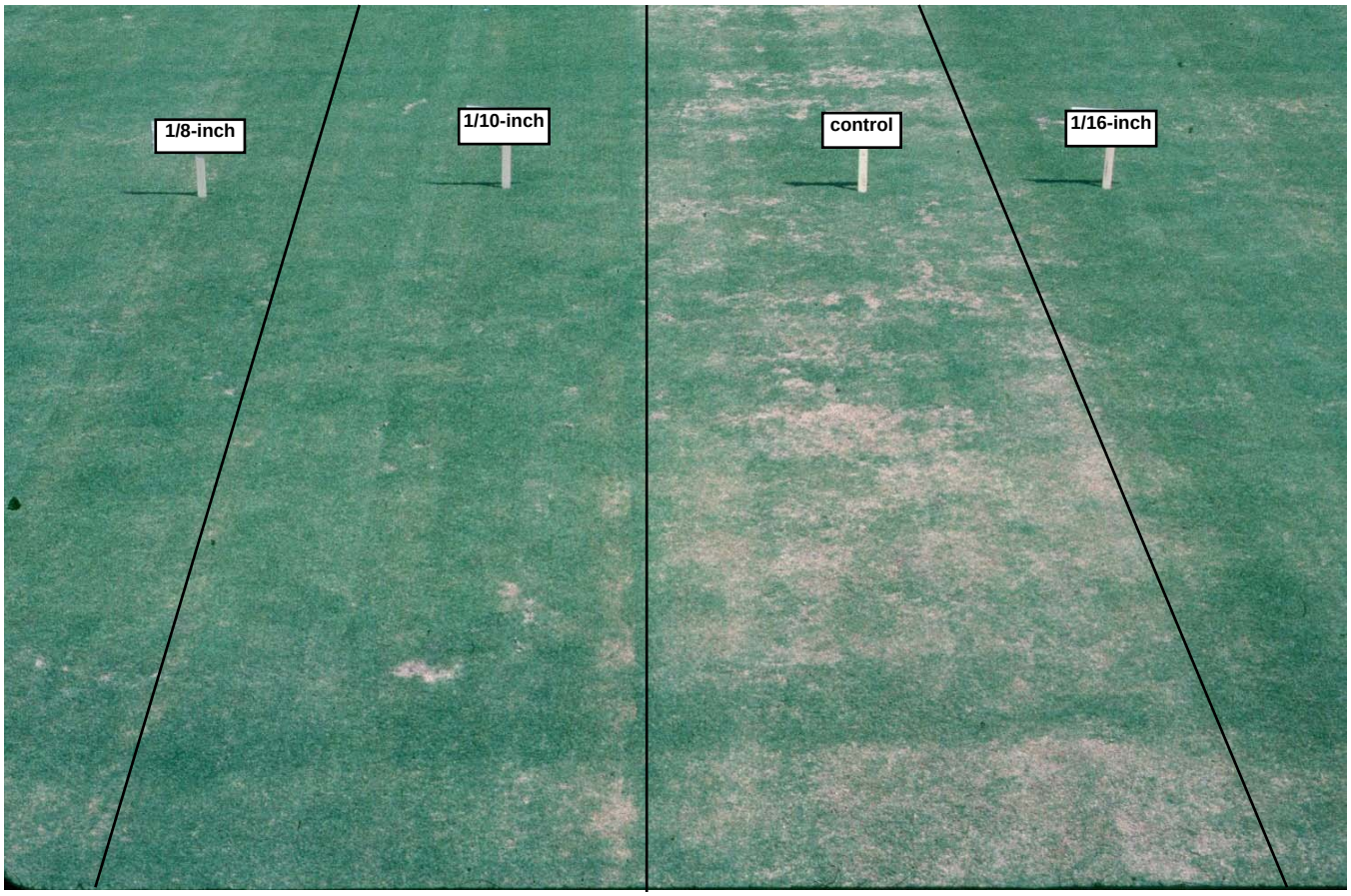

Figure 2. Plots at the end of 2002 (left to right): 1/8-inch, 1/10-inch, control, and 1/16-inch Graden blade treatments in 2001 and 2002.

August 3, following the April 17 verticutting, was similar for the various blade widths.

Increasingly more organic matter was pulled out of the ground as the blade width increased from 1/16-inch to 1/8-inch widths. The blades pulled out similar amounts of organic matter from both 1/4 and 1/2 lbs. N/1000 sq. ft. treatments even though the 1/2 lb. N / 1000 sq. ft.treatment had about 33% more organic matter. More organic matter could have been removed from the 1/2 lb. N/1000 sq. ft. treatments if the blades were allowed to cut to be bottom of this organic layer (approximately 40 mm, or 1.6 inches). We cut only to 25 mm (1 inch) in this study.

Second Year

In the second year of this study, blade width, N level, or Primo had little effect on overall turf quality (Table 1). Plots that had been verticut or received 1/2 lb. N/1000 sq. ft. did have significantly better overall color. However, less organic matter was removed from plots where the 1/8-inch blades were used compared to the other blade widths, probably because more organic matter was removed during the first year (Table 2). Turf quality was higher for plots receiving 1/2 lb. N/1000 sq. ft. for most of the year, but this began to change toward the end of the second year (data not shown). Primo appeared to have less effect on turf quality in 2002 than in 2001.

Verticutting removed less organic matter from Primo treated plots than from plots not receiving Primo (less plant growth) and from plots receiving 1/4 lb. N/1000 sq. ft. compared to those receiving 1/2 lb. N/1000 sq. ft. (again due to less plant growth). Turf quality of non-verticut plots deteriorated quickly toward the end of the second year (Table 1 and Figure 2).

By the beginning of the third year, the detrimental effects of no verticutting (even though sand was applied every two weeks) to remove

Figure 3. 'TifEagle' plots on March 7, 2003 receiving ½ lb. N/1000 ft^2 (left) and ¼ lb. N/1000 ft^2 (right) in 2001 and 2002.

thatch (Figure 2) and higher N levels (Figure 3) became evident. Although the results observed in this experiment do not have direct application to a high sand green, they do show that one does not want to apply more N than is necessary to produce healthy turf, and that too much thatch will result in poor and/or dead turf.

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