

RESEARCH

Chemical thatch control in a creeping bentgrass putting green

When used with proper cultural practices, Thatch-X, CPR or molasses applications may reduce thatch accumulation in creeping bentgrass greens.

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Thatch is a layer of tightly intermingled living and dead stems and turfgrass roots that develops between the soil surface and green turfgrass vegetation when the rate of organic matter production exceeds the rate of organic matter decomposition (1) (Figure 1).

It is possible to reduce thatch accumulation by mechanical means such as vertical mowing and core cultivation along with regular top-dressing (2,6). Because physical removal often reduces the quality of the playing surface, researchers have tested liquid products containing a nutrient, such as sucrose, that would encourage activity in microbes already present in the soil. This activity would presumably break down the thatch. Earlier research has shown that sucrose applications increased dollar spot (*Sclerotinia homoeocarpa*) activity and reduced turf quality, but glucose had no effect on thatch decomposition (5). Molasses applications also were found to have little influence on microbial activity within the soil (4). The objective of our research was to evaluate various chemicals and fertilizers for their ability to minimize thatch accumulation in creeping bentgrass greens.

Materials and methods

A two-year study was conducted to evaluate chemical thatch control in Crenshaw and A-1 creeping bentgrass (*Agrostis palustris* Huds.) greens. The experiment was conducted from December 2003 through October 2005 on a creeping bentgrass green located at the Clemson University turfgrass research center in Clemson, S.C. The soil profile consisted of an 85:15 silica sand:peat mix built to USGA recommendations with a soil pH of 6.0 (7).

Treatments, rates and application timings are listed in Table 1. Treatments consisted of an untreated control, CPR (Color-Performance-Roots) 4-0-1, Thatch-X (a biological



Figure 1. Undesirable summer performance of creeping bentgrass in a heat-stress environment. Note the green creeping bentgrass in previous aerification holes, where the thatch layer was removed.

thatch control agent), molasses and a treatment combination of 10 products (Table 1). CPR 4-0-1 is a liquid fertilizer containing sea-plant extracts, cytokinins, vitamins and amino acids designed to maintain turfgrass health without promoting excessive turfgrass growth. Thatch-X is described by its manufacturer as a blend of feed-grade organic meals and cold-water seaweed along with “selected microorganisms and other bioactive ingredients” with a fertilizer analysis of 4-2-5 (N:P₂O₅:K₂O). Molasses was an agriculture-grade product extracted from sugar cane.

The 10-product combination consisted of three applications of 10-50-0 G, a single application of 5-7-0 G, a single application of 0-0-50 G granular fertilizers and a tank-mix treatment including various liquid fertilizers combined with Carbo-Aid 3-1-3, Aquifer L and MicroAid L. According to its manufac-

turer, Carbo-Aid 3-1-3 is a blend of complex carbohydrates, amino acids, humate and North Atlantic kelp engineered as a food supplement for soil microbes. According to company literature, Carbo-Aid 3-1-3 increases microbial activity within the soil, improves turfgrass stress tolerance and increases nutrient retention within the soil root zone while reducing thatch. Aquifer L is a soil surfactant designed to enhance water infiltration and reduce localized dry spot. Micro-Aid L is a blend of magnesium, sulfur, boron, copper, iron, manganese, molybdenum and zinc.

Liquid treatments were applied with a CO₂-backpack sprayer calibrated at 0.46 gallon/1,000 square feet (187 liters/hectare) using 8003 flat-fan nozzles. Granular treatments were applied with shaker jars and irrigated in with 0.30 inch (0.75 centimeter) of water. Plot size was 6.6 × 9.8 feet (2 × 3 meters). Plots had similar thatch

density at the beginning of the study.

To prevent variability caused by disease, fungicides were applied on a preventive schedule to the untreated plots and plots treated with CPR, Thatch-X and molasses. Curative fungicides were applied as needed to plots with the 10-product combination. Research plots were mowed six times per week at 0.125 inch (3.25 millimeters) using a walk-behind greensmower.

Plots were core-aerified in April, May and September 2004 and 2005 with $\frac{5}{8}$ -inch (1.59-centimeter) diameter hollow tines on 2-inch (5-centimeter) spacing at a depth of 6 inches (15 centimeters); cores were removed. Thatch-X treatments were applied after each aerification and hand-brushed into aerification holes before topdressing with sand.

All plots were fertilized with 8.2 ounces nitrogen/1,000 square feet (25 kilograms/hectare) following aerification to promote turfgrass recovery. The untreated plots and plots treated with CPR, Thatch-X and molasses received liquid fertilizer applications every two weeks at 2 ounces nitrogen/1,000 square feet (6 kilograms/hectare) throughout the experiment. The 10-product combination received no additional fertility.

At the end of the study, thatch layer depth

was measured, and organic matter content, percent organic matter and organic matter density were calculated.

Turfgrass quality was evaluated once every two weeks on a scale of 1 to 9, where 1 = dead turf, 7 = minimum acceptable turf and 9 = excellent, high-quality turf.

Results

Crenshaw creeping bentgrass

After almost two years of application, CPR and Thatch-X significantly reduced thatch layer depth compared to the untreated control (Table 2). Thatch-X also significantly reduced percent organic matter (Table 2). The 10-product combination, CPR and Thatch-X all significantly reduced organic matter density as well (Table 2). Molasses had the least effect on thatch accumulation for Crenshaw creeping bentgrass.

A-1 creeping bentgrass

When compared to the untreated plots, all treatments significantly reduced the depth of the thatch layer in A-1 creeping bentgrass, but molasses had the greatest effect (Figure 2, Table 3). No differences were observed in percent organic matter within the thatch layer during the study (Table 3). Thatch-X,

molasses and the 10-product combination all significantly reduced organic matter density compared to the untreated control (Table 3).

Turf quality and disease occurrence

No statistical differences were observed for turfgrass quality throughout the study (data not shown). However, Crenshaw creeping bentgrass research plots receiving the 10-product combination and only curative fungicide applications were often infected with dollar spot 12 to 13 days after the last fungicide application. Dollar spot activity on A-1 creeping bentgrass remained minimal even after six weeks of no fungicide application. It was not determined whether dollar spot on Crenshaw creeping bentgrass influenced thatch measurements between the two cultivars.

Discussion

This study and previous research clearly suggest the newer, more aggressive creeping bentgrass cultivars require more intense management programs to reduce or minimize excessive accumulation of thatch. On a well-established creeping bentgrass green, Thatch-X applied after aerification was among the best options tested for chemical thatch control (Figure 2). Previous research indicates Thatch-X is not an effective

TREATMENTS

Treatment	Rate/1,000 square feet	Initial application date	Sequential applications*
Untreated	---	---	---
CPR 4-0-1 L	7.5 ounces	Mar. 22, 2004	every 14 days
Thatch-X	3 pounds	April 29, 2004	after aerification [†]
Molasses	5.35 ounces	Mar. 22, 2004	weekly
Combination			
10-50-0 G	2 pounds	Dec. 22, 2003	3 apps. at 21-day intervals
5-7-0 G	10 pounds	Feb. 27, 2004	none
0-0-50 G	2 pounds	Mar. 15, 2004	none
Carbo-Aid 3-1-3	3.0 fluid ounces	Mar. 22, 2004	every 14 days
Aquifer L	3.0 fluid ounces	Mar. 22, 2004	every 14 days
20-3-5 L	4.77 fluid ounces	Mar. 22, 2004	every 14 days
9-18-9 L	7.16 fluid ounces	Mar. 22, 2004	every 14 days
10-0-0 21S	2.38 fluid ounces	Mar. 22, 2004	every 14 days
32% Mn	3.58 fluid ounces	Mar. 22, 2004	every 14 days
MicroAid L	3.58 fluid ounces	Mar. 22, 2004	every 14 days

*Sequential treatments were applied until October 2005.

[†]Thatch-X was only applied after aerification (three times per year).

Table 1. Treatments, rates, and application timings used in chemical control of thatch in A-1 and Crenshaw creeping bentgrass studies.

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Photo by Bert McCarty

Figure 2. Thatch layer profile of A-1 creeping bentgrass after almost two years of treatment applications. Treatments are (left to right): untreated, CPR 4-0-1, 10-product combination, molasses and Thatch-X.

thatch control option on newly planted, aggressively growing greens (6), but it can reduce organic matter on slower-growing established greens following prolonged (for example, two-year) use (3). As with other sucrose-containing products (5), molasses appears somewhat inconsistent in stimulating biological thatch control, but it may provide long-term relief if used routinely. In our research, molasses increased organic matter decay in A-1 creeping bentgrass (Figure 2) but not in Crenshaw.

With proper fertility programs, core cultivation, vertical mowing, topdressing and possibly Thatch-X, CPR or molasses applications, the new creeping bentgrass cultivars can provide excellent putting green surfaces for many years with minimal thatch accumulation and reduced fungicide applications.

THE RESEARCH

says . . .

- **A 10-product combination**, Thatch-X, CPR and molasses were evaluated for their ability to minimize thatch accumulation in creeping bentgrass greens.
- **When compared to** the untreated plots, all treatments significantly reduced the depth of the thatch layer in A-1 creeping bentgrass.
- **On a well-established** creeping bentgrass green, Thatch-X applied after aerification was among the best options tested for chemical thatch control.
- **In combination with** proper fertility programs, core cultivation, vertical mowing and topdressing, possibly Thatch-X, CPR or molasses applications can reduce thatch accumulation in the newer creeping bentgrass cultivars.

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THATCH IN CRENSHAW

Treatment	Thatch measurements*		
	Thatch layer depth (centimeters)	% organic matter	Organic matter density (milligrams/cubic centimeter)
Untreated	1.60 a	10.30 a	20.1 a
CPR	1.40 b	10.63 a	17.2 c
Thatch-X	1.07 c	6.03 b	12.9 d
Molasses	1.53 ab	10.77 a	20.1 a
10-treatment combo	1.47 ab	10.10 a	18.7 b

*Different letters among treatments (in the same column) indicate a significant difference.

Table 2. Thatch measurements as influenced by treatment applications to a Crenshaw creeping bentgrass putting green for two consecutive years.

THATCH IN A-1 CREEPING BENTGRASS

Treatment	Thatch measurements*		
	Thatch layer depth (centimeters)	% organic matter	Organic matter density (milligrams/cubic centimeter)
Untreated	1.80 a	10.17 a	21.4 a
CPR	1.53 b	9.03 a	18.1 ab
Thatch-X	1.47 bc	7.90 a	14.1 c
Molasses	1.27 c	7.47 a	12.3 c
10-treatment combo	1.37 bc	8.93 a	14.4 bc

*Different letters among treatments in the same column indicate a significant difference.

Table 3. Thatch measurements as influenced by treatment applications to an A-1 creeping bentgrass putting green for two consecutive years.