



THATCHzyme 2023 Report

Last updated 1/19/2024

Customer Trials

Across the USA – 2021 to 2023

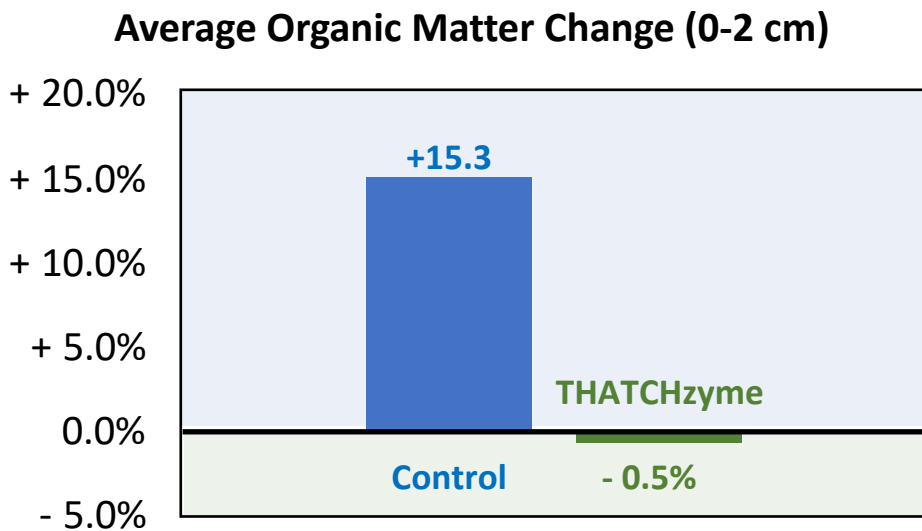
Summary

THATCHzyme lowered organic matter accumulation in the 0-2 cm fraction by an average of 15.8% across 9 real world testing sites relative to control plots.

Description

We partnered with leading golf courses across the country to establish 9 real world testing sites. Participants chose an area for treatment and a comparable area under the same growing conditions and cultural practices to leave untreated as a control. Thatch accumulation was assessed by performing organic matter soil testing (loss on ignition) on soil samples sliced at a depth 0 to 2 cm. Soil tests were performed throughout the season and accumulation was determined by the change in organic matter between the beginning and end of the season.

Results



Across 9 testing sites organic matter was measured by loss on ignition at the beginning and end of the season. The control plots increased by an average of 15.3%, while the **THATCHzyme** treated plots decreased by an average of 0.5%. This results in a 15.8% accumulation difference between the treated and control areas.

Location	% Change Control	% Change Treated	OM Accumulation Difference
Bethesda, MD	+ 24.2%	+ 5.5%	- 18.7%
Lincolnwood, IL	+ 21.6%	+ 10.7%	- 10.8%
Lincolnwood, IL	- 7.7%	- 10.5%	- 2.8%
Jackson Hole, WY	+ 26.5%	+ 3.9%	- 22.7%
Jackson Hole, WY	+ 26.3%	+ 14.7%	- 11.6%
Big Sky, MT	+ 16.6%	+ 0.6%	- 16.0%
Edwards, CO	+ 11.6%	- 24.2%	- 35.7%
Woodmoor, CO	+ 12.2%	- 3.2%	- 15.4%
Manchester, VT	+ 6.0%	- 2.5%	- 8.5%
Average	+ 15.3%	- 0.5%	- 15.8%

Percent change for the control and **THATCHzyme** treated areas and the resulting organic matter accumulation difference for our 9 testing sites.

Methods

Soil Test Protocol

5 to 10 soil samples were randomly taken from both the treated and control areas. Samples were sliced at a depth of 0-2 cm, 2-4 cm, 4-6 cm before shipping. Upon arrival samples were pooled together and dried at 80 °C for >48 hr. Samples were allowed to come to room temperature and the dry weight was recorded. Samples were fully combusted at 440 °C for 4 hours in a furnace. Samples were allowed to come to room temperature and the ashed weight was recorded. Organic matter percentage is calculated by the percentage of mass loss on ignition. $OM\% = (Dry\ Weight - Ashed\ Weight) / Dry\ Weight$

Percent Change OM% 0-2 cm over the season

Percent change is the percent difference from the beginning and end of the season. This helps us compare organic matter across testing sites with varying starting amounts. The organic matter accumulation difference is the difference between the control and treated areas.

$\% \text{ Change} = (End\ OM\% - Initial\ OM\%) / Initial\ OM\% \times 100$

$OM\ \text{Accumulation\ Difference} = \% \text{ Change Treated} - \% \text{ Change Control}$

Multi Season Longitudinal Study

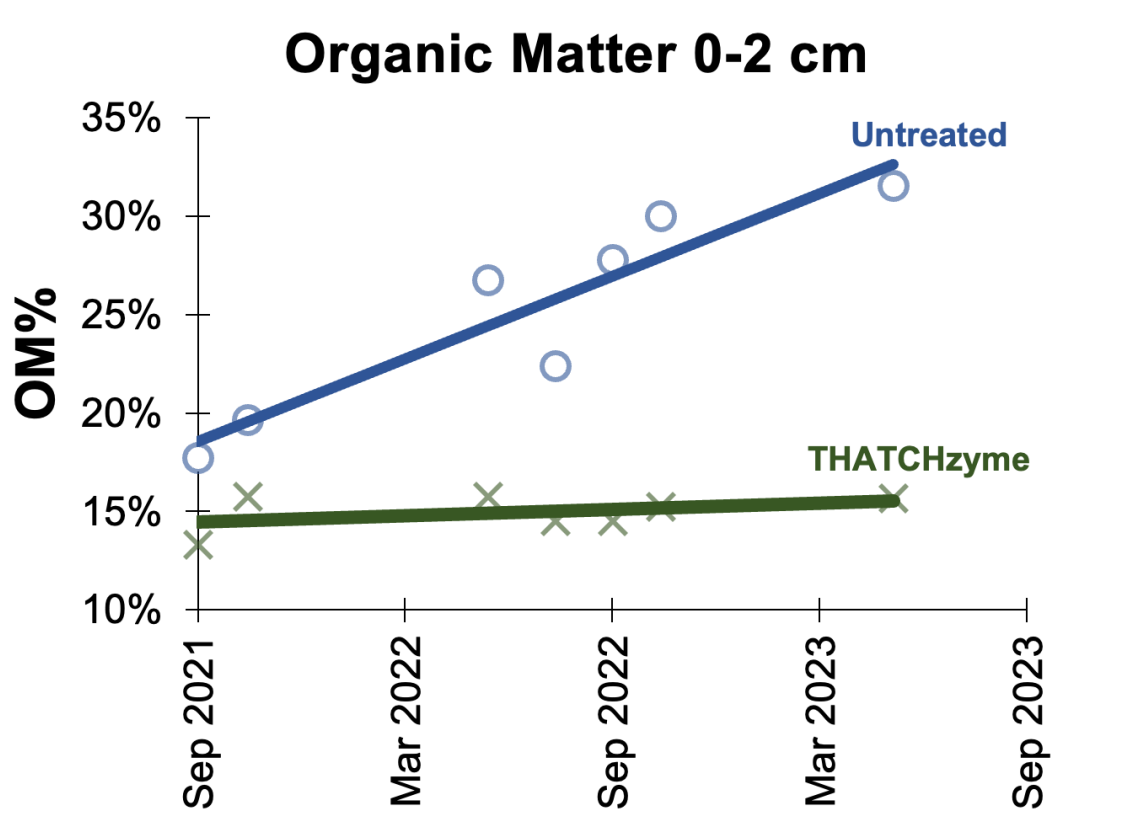
Country Club at Woodmoor – 2021 to 2023

Summary

Organic matter continually increased in the 0-2 cm depth of the control plot, while it remained nearly constant in the **THATCHzyme** treated plot.

Description

The Country Club at Woodmoor (Woodmoor, CO) began weekly THATCHzyme treatments in the fall of 2021. Organic matter testing (OM246) was performed regularly throughout the season. The treated and untreated tees contained a mixture of bentgrass and Poa annua.



Organic matter continually increased in the 0-2 cm depth of the control plot, while it remained nearly constant in the **THATCHzyme** treated plot.

Application Frequency Study

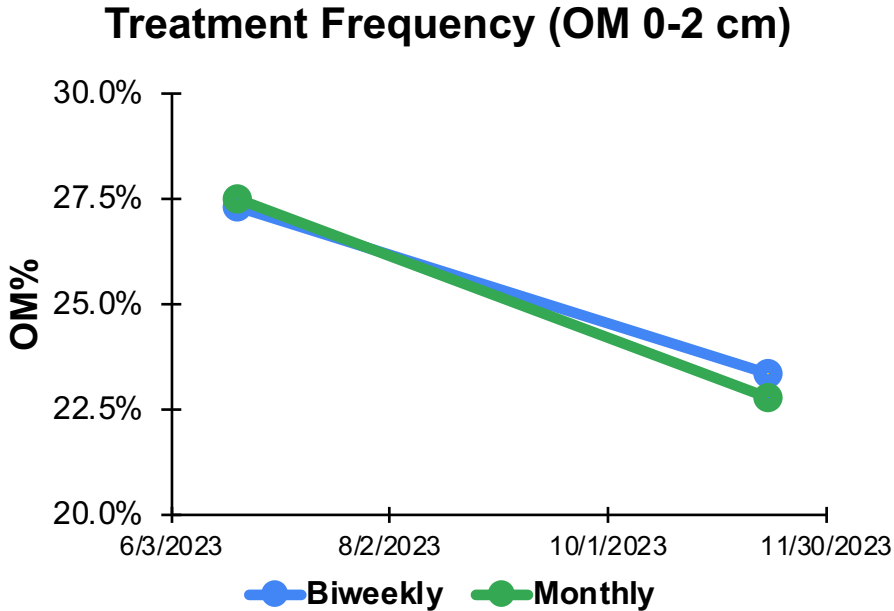
Country Club at Woodmoor (2023)

Summary

Over the course of a single season, **THATCHzyme** treatments decreased organic matter by 14.4% on the biweekly treated plot and 21% on the monthly treated plot. This demonstrates both application rates are effective and reversed the historical trend from the longitudinal study.

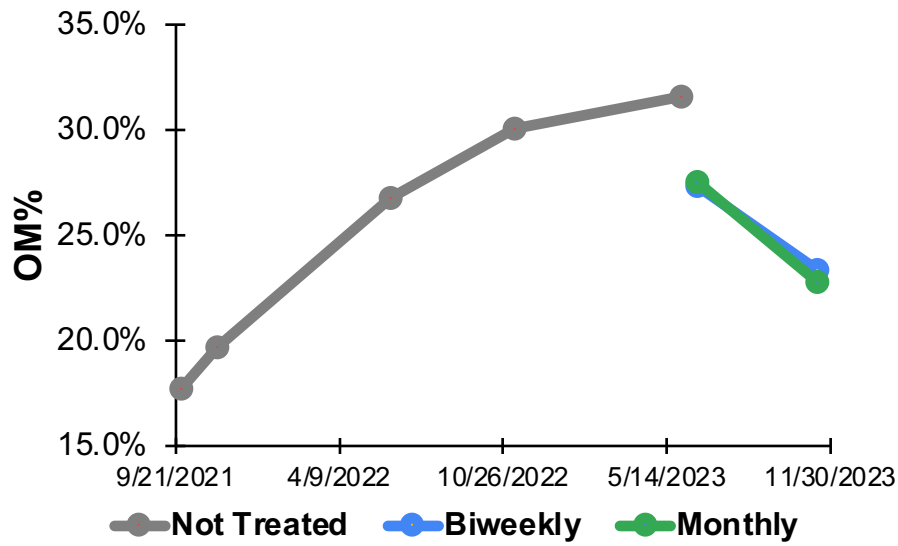
Description

The control plot from the original longitudinal study showed a continuous increase in organic matter from Fall 2021 to Spring 2023. This plot was split in half for the 2023 season and biweekly and monthly THATCHzyme treatments were performed at the recommended rates. Organic matter testing (OM246) was performed at the beginning and end of the season. The treated and untreated tees contained a mixture of bentgrass and Poa annua.



Biweekly and monthly **THATCHzyme** treatments reduced organic matter in the 0-2 cm fraction over the course of a single season.

Organic Matter 0-2 cm Historical



Biweekly and monthly **THATCHzyme** treatments strongly reversed the historical trend of accumulating organic matter.

Soil Profile Study

Congressional Country Club (Gold) (Bethesda, MD) – 2023

Summary

THATCHzyme treated area visibly reduced layers of undigested thatch, improved root mass, and improved the soil profile. In addition, **THATCHzyme** reduced organic matter accumulation by 18.7% versus the control.

Description

20+ year old bentgrass/poa tees were selected to test THATCHzyme vs. a control. The tee boxes on hole 16 was treated with THATCHzyme and hole 4 was left untreated as a control. The tee boxes are located next to each other under the same growing environments and cultural practices. Organic matter soil tests (OM246) were taken prior to initiating treatments and throughout the season.

Results



Treatments were performed on 16 tee and 4 tee was left untreated as a control.



Organic matter soil tests were performed to compare the rate of organic matter accumulation.

May 2023 – Start of Trial



THATCHzyme
(prior to treatments)

Control



Prior to the initiation of treatments, visible thatch layers were present on both the treated (16 tee) and control (4 tee) areas on 20+ year old bentgrass/poa tees.

August 2023 – 12 weeks



THATCHzyme

Control



*Within 12 weeks the thatch layers were significantly reduced in the **THATCHzyme** treated area (16 tee) versus the control area (4 tee) on 20+ year old bentgrass/poa tees.*

December 2023 – 31 weeks



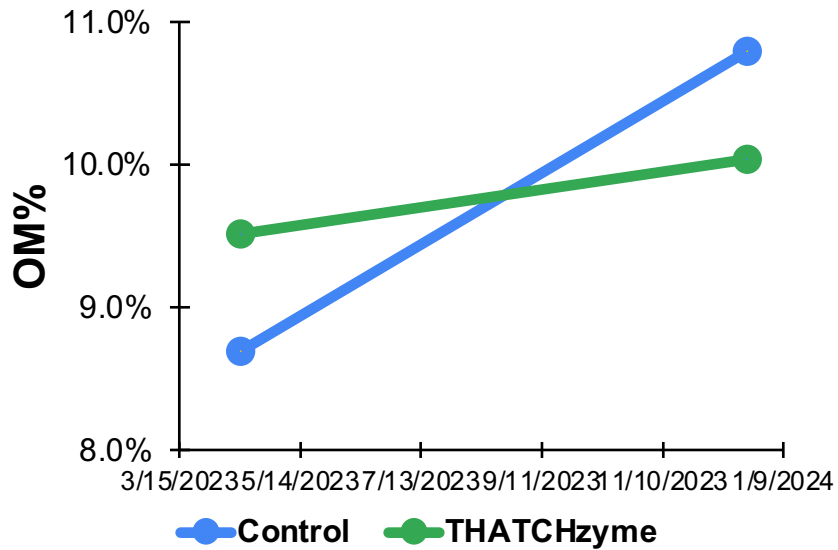
THATCHzyme

Control



*At the end of the 2023 season there the **THATCHzyme** treated area had significantly less visible thatch compared to the control area on 20+ year old bentgrass/poa tees.*

Organic Matter 0-2 cm



The **THATCHzyme** treated plot decreased the rate of organic matter accumulation by 18.7% on 20+ year old bentgrass/poa tees.

Root Length Study

Colorado Biofactory Greenhouse – 2023

Summary

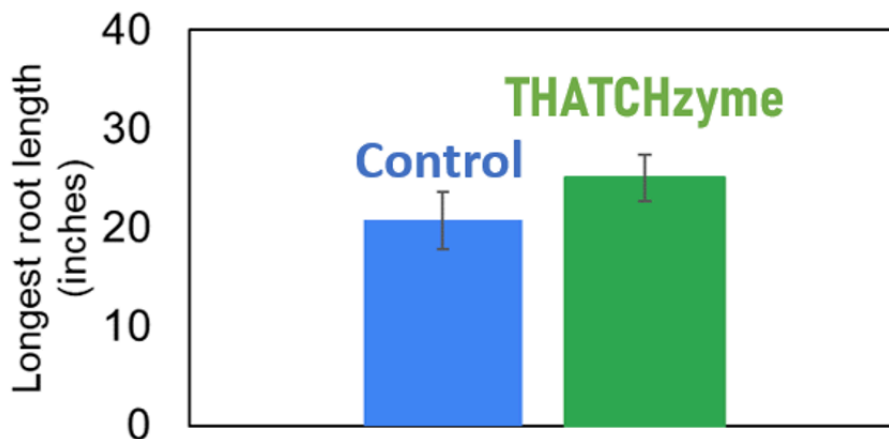
10 weeks of biweekly **THATCHzyme** treatment significantly increased creeping bentgrass maximum root length by 21% ($p < 0.05$).

Description

Experiments were conducted in 2023-2024 in a greenhouse at Colorado Biofactory headquarters as a preliminary investigation of **THATCHzyme** foliar applications effect on root growth.

Results

Maximum Root Length at 10 weeks



Average maximum root lengths measured at 10 weeks ($n = 9$; error bars reflect standard deviation).

Control THATChzyme



Representative turfgrass tubes

Methods

Bentgrass Rooting Tube Construction

Creeping bentgrass was grown in 1.25 inch diameter clear polyethylene tubes filled with 80:20 v/v USGA spec sand and screened spagnum peat moss held in PVC tubes oriented at a 30° angle. Creeping bentgrass was sown at 3 lb/1000 square feet by mixing into the top layer of sand in each tube and given two weeks to establish prior to the first THATChzyme treatment. Tubes received overhead mist irrigation four times per day through the duration of the study. Andersons 10-10-10 fertilizer with iron and micronutrients was applied to each tube immediately after seeding and after 5 weeks. Leaf tissue was trimmed back to 1.5 inch twice across the 10 week study.

Maximum Root Length Measurements

Maximum root length was determined at 10 weeks by taking measurements from foliar tissue to the longest visible terminal root in each tube.

Academic Random Plot Study (*In progress*)

Dr. Tony Koski, Colorado State University – 2023

Summary

*Results suggest that biweekly and monthly **THATCHzyme** treatments reduce organic matter in the 0-2 cm fraction. Trial is in progress and will resume in Spring 2024.*

Description

To test the effect of **THATCHzyme** treatment frequency, we partnered with Dr. Tony Koski at Colorado State University. A random block design with 3 replicates for each condition is being performed at Harmony Golf Club in Fort Collins, Colorado on a bentgrass nursery. All blocks are receiving biweekly topdressing. Treatments were as follows: control (topdressing only), **THATCHzyme** biweekly, **THATCHzyme** monthly, and **THATCHzyme** plus an undisclosed additive at biweekly and monthly frequencies. The trial began on 8/10/2023 and was performed until the end of the growing season (~12 weeks). The trial will be resumed in Spring 2024, stay tuned for updated results.

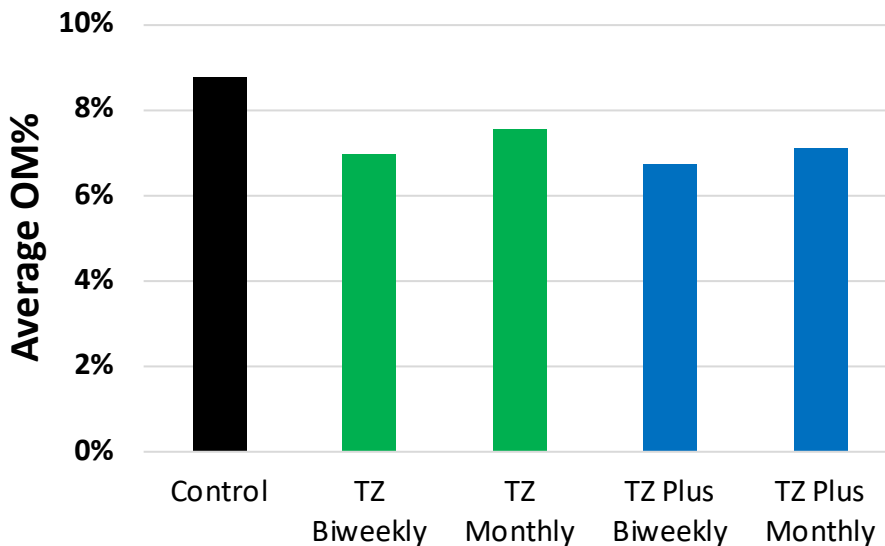
Picture of Testing Site



Picture of the trial area with strings used to section of treatment blocks.

Results

CSU Trial End of 2023 Season Following 12 Weeks of Treatments Average OM% 0-2 cm (preliminary results)



The trial suggests that both biweekly and monthly **THATCHzyme** treatments reduces organic matter in the 0 to 2 cm fraction versus the control plots. TZ = THATCHzyme, TZ Plus = THATCHzyme plus an undisclosed additive.

CSU Trial End of 2023 Season Following 12 Weeks of Treatments OM% 0-2 cm (preliminary results)

Sample	Plot 1	Plot 2	Plot 3	Average
Control	9.33%	8.67%	8.33%	8.78%
TZ Biweekly	6.38%	5.29%	9.22%	6.97%
TZ Monthly	8.91%	6.03%	7.76%	7.57%
TZ Plus Biweekly	5.78%	7.18%	7.23%	6.73%
TZ Plus Monthly	6.95%	5.22%	9.15%	7.11%

Raw data from ongoing trial. TZ = THATCHzyme, TZ Plus = THATCHzyme plus an undisclosed additive.

Methods

Soil Sample Protocol

At the end of the 2023 season (12 weeks after the initiation of treatments), 5 soil samples were taken from each plot and sliced at a depth of 0-2 cm, 2-4 cm, and 4-6 cm. Samples from each plot were pooled together and organic matter was measured by loss on ignition at 440 °C for 4 hours.