

Golf Course Putting Green Organic Matter Recycling Study

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Introduction

Putting greens on golf courses are the highest maintenance turfgrass that exists. Creeping bentgrass (*Agrostis stolonifera* L.) often is used for cool-season putting greens due to the ability of the turfgrass to tolerate a low mowing height, and provide a high density turf. Managing organic matter is necessary to maintain a high quality turfgrass at 0.125 in. height of cut and one that will drain quickly after a rain to resume play.

Traditionally organic matter has been managed by a three-step process: hollow tine aerification, removal of the cores from the surface, and applications of new sand to the putting green. However, many superintendents can't afford to buy new sand every year.

Wiedenmann Turf Equipment Company offers a machine that will remove much of the organic matter from aerification cores by spinning them over screens and allowing the sand particles to fall back to the putting green surface, while collecting the organic matter in a basket for removal.

The objective of this project was to compare if putting green surfaces subjected to core recycling would perform as well as traditional organic matter removal practices. This is the first year of a two-year study.

Materials and Methods

Research was conducted at the Iowa State University Horticulture Research Station on a

USGA sand-based creeping bentgrass putting green. The experimental design was a randomized strip plot design. Whole plot treatments were either traditional hollow tine aerification, core removal, and new sand applications, or hollow tine aerification, recycling of cores, and additional new sand added to fill in aerification holes. Strip plot treatments were sand topdressing timing with either sand topdressed before hollow tine aerification or sand topdressed after hollow tine aerification. Four replications of every treatment were included and the study will be repeated over two years.

Treatments were applied September 19, 2016, and September 25, 2017, with a 0.625 in. hollow tine aerification tine on 2 in. x 2 in. spacing with a Toro ProCore 648 aerifier.

Three random locations on every plot were selected to be used every time to capture digital images, and digital image analysis (DIA) was performed to track recovery of green tissue. These pictures were collected weekly, and the data used to track weeks until 100 percent green cover.

Additional data collected included surface hardness with a TruFirm device, green speed, water infiltration, clippings to determine if more sand was removed, and soil organic samples.

Results and Discussion

A significant year-by-treatment and date-by-treatment interaction was determined between DIA $P > 0.001$ (Table 1). Treatments increased in percent green cover with time as expected, and differences between treatments were only significant on one date in 2016 and on every rating date in 2017. Although the differences were significant, they were not noticeable to the human eye. No differences

were detected in soil moisture for any treatment or for ball roll (stimp) on any treatment or rating date. In 2016, treatments with core recycling had lower water infiltration rates than traditional aerification and topdressing after aerification (Table 3). Water infiltration did vary in the second year of the study (Table 3), with traditional aerification and topdressing before aerification having the highest water infiltration rate (175 mm/hr), which was not different from any other treatment.

Additional soil physical properties are being tested to investigate the potential change in soil organic matter with core recycling. This data still is being analyzed and must be considered before a conclusion can be drawn.

Acknowledgements

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Table 1. Digital image analysis for date-by-treatment of percent green turfgrass cover for various putting green organic matter management treatments, 2017.

Treatment description	Percent green turfgrass cover			
	0 DAT	7 DAT	14 DAT	21 DAT
Traditional (T) ^a + topdress post aerification (TPA) ^b	27	77	83	82
T + topdress before aerification(TBA) ^c	26	71	78	74
Core recycling (CR) ^d + TBA	27	74	82	79
CR + TPA	26	76	82	80
LSD (P = 0.05)	NS ^e	5.2	NS	7.2

^aTraditional aerification consisted of hollow tine aerification and core removal.

^bTopdress post aerification consisted of adding new sand after aerification.

^cTopdress before aerification consisted of adding new sand before aerification and additional sand as needed to fill aerification holes after aerification.

^dCore recycling consisted of hollow tine aerification and having cores subjected to the Wiedenmann Core Recycler to return sand from the cores back to the plots.

^eNS = not significant at the alpha level = 0.05.

Table 2. Digital image analysis for date-by-treatment of percent green turfgrass cover for various putting green organic matter management treatments, 2017.

Treatment description	Percent green turfgrass cover		
	7 DAT	21 DAT	28 DAT
Traditional (T) ^a + topdress post aerification (TPA) ^b	91	99	99
T + topdress before aerification(TBA) ^c	84	99	99
Core recycling (CR) ^d + TBA	79	98	98
CR + TPA	75	98	98
LSD (P = 0.05)	6.6	NS ^e	NS

^aTraditional aerification consisted of hollow tine aerification and core removal.

^bTopdress post aerification consisted of adding new sand after aerification.

^cTopdress before aerification consisted of adding new sand before aerification and additional sand as needed to fill aerification holes after aerification.

^dCore recycling consisted of hollow tine aerification and having cores subjected to the Wiedenmann Core Recycler to return sand from the cores back to the plots.

^eNS = not significant at the alpha = 0.05 level.

Table 3. Water infiltration rates for year-by-treatment of various putting green organic matter management treatments, 2016 and 2017.

Treatment description	Water infiltration rate (mm/hr)	
	2016	2017
Traditional (T) ^a + topdress post aerification (TPA) ^b	147	166
T + topdress before aerification(TBA) ^c	213	175
Core recycling (CR) ^d + TBA	133	132
CR + TPA	88	139
LSD (P = 0.05)	77	113

^aTraditional aerification consisted of hollow tine aerification and core removal.

^bTopdress post aerification consisted of adding new sand after aerification.

^cTopdress before aerification consisted of adding new sand before aerification and additional sand as needed to fill aerification holes after aerification.

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