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Dani McFadden
Kansas State University, dmcfadden@k-state.edu

Jack D. Fry
Kansas State University, jfry@ksu.edu

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Aerification Effects on ‘Innovation’ Zoysiagrass in 2020-2021

Abstract

When a thatch layer accumulates on turfgrass it can be detrimental to the stand. A field experiment was initiated to investigate aerification treatments and their influence on thatch (organic matter level), quality, and color of ‘Innovation’ zoysiagrass that was sodded within the past year. Turfgrass that was intensely aerified had less organic matter content in the surface inch of the profile compared to turfgrass that was not aerified. Color was also enhanced in treatments receiving aerification compared to non-aerified turf, which may have been attributed to trending of higher nitrate content in aerified plots.

Keywords

aerification, Innovation, zoysiagrass

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Aerification Effects on 'Innovation' Zoysiagrass in 2020-2021

Dani McFadden and Jack D. Fry

Summary

When a thatch layer accumulates on turfgrass it can be detrimental to the stand. A field experiment was initiated to investigate aerification treatments and their influence on thatch (organic matter level), quality, and color of 'Innovation' zoysiagrass that was sodded within the past year. Turfgrass that was intensely aerified had less organic matter content in the surface inch of the profile compared to turfgrass that was not aerified. Color was also enhanced in treatments receiving aerification compared to non-aerified turf, which may have been attributed to trending of higher nitrate content in aerified plots.

Objective

The objective of this research was to determine the influence of aerification on thatch levels and rooting of Innovation zoysiagrass.

Study Description

A field experiment was initiated in the summer of 2020 and repeated in 2021 at the Kansas State University Olathe Horticulture Research and Extension Center in Olathe, KS, to determine the effects of aerification on reducing thatch in Innovation zoysiagrass (*Zoysia japonica* × *Z. matrella*), and the impact on turf quality and rooting. The experiment was arranged in a randomized complete block design with three replicates. For the first year of the study, a John Deere Aercore 800 with 5/8-in. diameter tines was used to pull cores 2.5-in. deep. Treatments were imposed on June 26, 2020, and included no aerification, moderate aerification (one pass with aerifier, 63 cores ft^{-2}), and intensive aerification (two passes with aerifier, 126 cores ft^{-2}). For the second year of the study, a Ryan Greensaire Aerator was used to pull cores 2.0 in.-deep and 0.25 inches in diameter over the same experimental plots as the previous

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year (Figure 1). Treatments were imposed on June 21, 2021, and included no aerification, moderate aerification (two passes with aerifier, 60 cores ft^{-2}), and intensive aerification (four passes with aerifier, 120 cores ft^{-2}). Turf quality was visually rated on a 1 to 9 scale (1 = poorest quality; 9 = optimum color, density, and uniformity), and turf color was visually rated on a 1 to 9 scale (1 = no color retention; 9 = dark green). Two cores measuring 2 inches in diameter and 1-in. deep were pulled from each plot on September 24, 2020, and October 18, 2021, then tested for organic matter using weight loss on ignition (% by weight). Cores measuring 1-inch in diameter were sampled from three random areas in each plot and the profile separated into 0 to 3 cm, 3 to 6 cm, 6 to 9 cm, and 9 to 12 cm to determine rooting.

Results

In 2020, there was a decrease in thatch (organic matter) within the surface 1 inch under Innovation zoysia when it was intensively aerified compared to plots that were not aerified ($P < 0.10$; Table 1). Moderate and intensive aerification resulted in greater root weights at a 0 to 3 cm depth when sampled three months after treatment in 2020 (Table 2). Intensive aerification treatments were significantly lower in quality compared to no aerification treatments; however, quality increased throughout the duration of the growing season post-aerification (Table 3).

In 2021, there was significantly less organic matter when turfgrass was moderately or intensively aerified compared to turfgrass that did not receive aerification. Moderate aerification was found to have increased rooting compared to non-aerified and intensively aerified turfgrass. Plots that were aerified moderately or intensively generally had a darker green color compared to plots that were not aerified (Table 4; Figure 2). Elevated weed pressure was noted in plots receiving intensive and moderate aerification (data not shown), which was likely the result of weed seeds brought to the surface during the aerification process.

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Table 1. Influence of aerification on thatch (organic matter to a 1-inch depth) three months after treatment in 2020 and 2021

	Organic matter (%)[a]	
Aerification treatment	**2020[b]**	**2021[c]**
None	14.6b[d]	19.7b
Moderate	11.6ab	15.8a
Intensive	10.2a	13.4a

[a] Each sample was oven dried at 220°F +/- 5°F, for more than 24 hours. Each dried sample was weighed and then ashed at 1,067°F for 6 hours. The ashed samples were weighed and the loss on ignition organic matter content weights were calculated.
[b] Treatments were imposed on June 26, 2020, using 5/8-in. tines to pull cores 2.5-in. deep. Moderate aerification = 63 hollow tines ft^{-2}, intensive aerification = 126 hollow tines ft^{-2}.
[c] Treatments were imposed on June 21, 2021, and pulled cores 2.0-in. deep and 0.25 inches in diameter. Moderate aerification = 60 hollow tines ft^{-2}, intensive aerification = 120 hollow tines ft^{-2}.
[d] Means followed by the same letter in a column are not significantly different according to Tukey's HSD ($P \leq 0.10$).

Table 2. Influence of aerification on root dry weight of Innovation zoysiagrass

	Dry weight (mg)[a]					
	2020			2021		
Depth (cm)[b]	**None**	**Moderate**	**Intensive**	**None**	**Moderate**	**Intensive**
0–3	380b[c]	611a	599a	243bc	713a	340b
3–6	62c	49c	86c	27d	137cd	67cd
6–9	20c	37c	34c	10d	77cd	40d
9–12	11c	23c	32c	13d	10d	17d

[a] Dry weights were recorded after a 48-hour oven dry-down period at 150°F.
[b] Root samples were collected on September 24, 2020, and October 18, 2021, three months after aerification treatments.
[c] Means followed by the same letter are not statistically different within experimental years according to Tukey's HSD ($P \leq 0.05$).

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Table 3. Influence of aerification treatment on turfgrass quality of Innovation zoysiagrass in Olathe, KS, in 2020 and 2021

Aerification treatment	Turfgrass quality[a]						
	2020[b]				2021[c]		
	6/29	7/6	7/24	7/31	6/22	7/14	9/10
None	6.3a[d]	6.7a	8.0a	7.3a	6.7a	7.7a	7.0a
Moderate	4.3b	6.0a	8.0a	7.0a	5.0b	7.0a	6.3ab
Intensive	2.7c	4.3b	6.3b	6.7a	4.0c	6.0b	6.0b

[a] Turf quality was visually rated on a 1 to 9 scale (1 = poorest quality, 9 = optimum color, density, and uniformity).
[b] Treatments were imposed on June 26, 2020, using 5/8-in. tines to pull cores 2.5-in. deep. Moderate aerification = 63 cores ft^{-2}, Intensive aerification = 126 cores ft^{-2}.
[c] Treatments were imposed on June 21, 2021, and pulled cores 2.0-in. deep and 0.25 inches in diameter. Moderate aerification = 60 cores ft^{-2}, Intensive aerification = 120 cores ft^{-2}.
[d] Means followed by the same letter in a column are not significantly different according to Tukey's HSD ($P \leq 0.05$).

Table 4. Influence of aerification treatment on turfgrass color of Innovation zoysiagrass in Olathe, KS, in 2020 and 2021

Aerification treatment	Turfgrass color[a]					
	2020[b]			2021[c]		
	7/24	7/31	8/24	6/22	7/14	9/10
None	7.0b[d]	6.0c	6.3b	6.7b	6.3b	5.7c
Moderate	8.0a	7.0b	7.0ab	7.3ab	7.3a	7.0b
Intensive	8.7a	8.0a	7.7a	7.7a	8.0a	8.0a

[a] Turf color was visually rated on a 1 to 9 scale (1 = no color retention, 9 = dark green).
[b] Treatments were imposed on June 26, 2020, using 5/8-in. tines to pull cores 2.5-in. deep. Moderate aerification = 63 cores ft^{-2}, Intensive aerification = 126 cores ft^{-2}.
[c] Treatments were imposed on June 21, 2021, and pulled cores 2.0-in. deep and 0.25 inches in diameter. Moderate aerification = 60 $cores^{-2}$, Intensive aerification = 120 cores ft^{-2}.
[d] Means followed by the same letter in a column are not significantly different according to Tukey's HSD ($P \leq 0.05$).

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Figure 1. Ryan Greensaire Aerator used to impose aerification treatments on June 21, 2021.

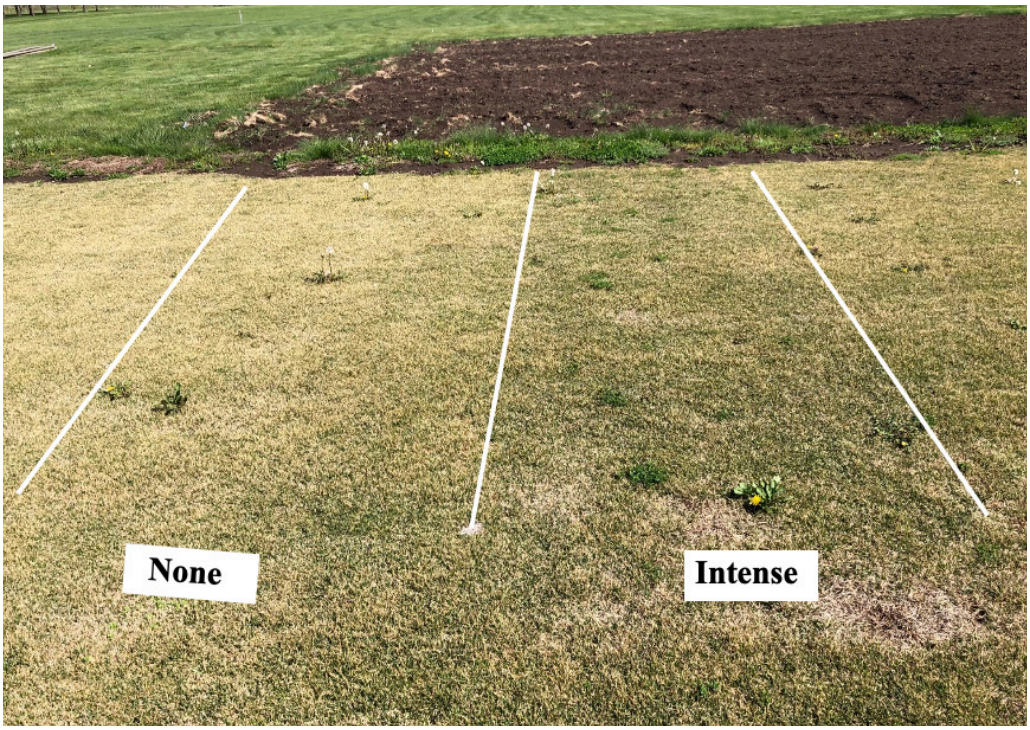

Figure 2. Color differences during spring greenup of treatments in April of 2021.

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