TURFGRASS RESEARCH
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Aerification Effects on 'Innovation' Zoysiagrass in 2020–2022

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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 the trending higher nitrate content in aerified plots. Moderately aerified turf significantly increased rooting from 0 to 9 cm below the soil profile compared to non-aerified turf.

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 study was conducted at the Olathe Horticulture Research and Extension Center in Olathe, KS (long. 39.48° N, 95.66° W) in 2020 (Year 1), 2021 (Year 2), and 2022 (Year 3) to determine the effects of aerification intensities on reducing thatch in Innovation zoysiagrass (*Zoysia japonica* × *Z. matrella*), and its impact on turf quality and rooting. The experiment was arranged in a randomized complete block design with three replicates. Plots measured 5 × 15-ft and replications were separated by a 2-ft border. Treatments included no aerification, moderate aerification, and intensive aerification. The amount of cores and tine size varied by experimental year; however, intensive aerification treatments had two times the amount of cores pulled per plot compared to moderately aerified plots for each year of the exper-

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iment. Moderate aerification treatments had 63 cores/ft^2, 60 cores/ft^2, and 42 cores/ft^2 pulled in 2020, 2021, and 2022, respectively. Intensive aerification treatments had 126 cores/ft^2, 120 cores/ft^2, and 80 cores/ft^2 pulled in 2020, 2021, and 2022, respectively. Aerification date, core cultivator, core depth, and tine diameter are shown in Table 1.

Following aerification, a steel drag mat was evenly dragged over individual plots to smooth the turfgrass surface. Plots were maintained at 1.5-inch height of cut, no supplemental irrigation was applied except to water in fertilizer applications. 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). Spring greenup was visually rated on a 1 to 9 scale (1 = straw brown; 9 = completely green plot color) during the transition from winter dormancy to active spring growth. Turfgrass wilt was visually rated on a 1 to 9 scale (1 = complete wilting, 100% leaf firing; 9 = no wilt, no leaf firing) during periods of drought stress each year. Organic matter was determined by pulling two cores 2 inches in diameter and 1-inch deep from each plot on September 24, 2020, October 18, 2021, and September 26, 2022. 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 h. The ashed samples were weighed and the loss on ignition of organic matter content weights were calculated.

On the same dates mentioned above, cores measuring 1 inch in diameter were sampled from three random areas in each plot and the profile separated into 0–3 cm, 3–6 cm, 6–9 cm, and 9–12 cm from below the shoot system. Root zone materials from the samples were placed on a sieve and soil was washed from the roots. Roots were then placed in individual paper bags and dried for approximately 48 h in an electric drying oven (Thermo Scientific, Model 658, Marietta, OH, USA) at 150°F. After the 48 h, dried roots were weighed to determine the rooting depth for each treatment.

Results

Turf quality across experiment year × aerification intensity interaction had a significant effect for June when data were combined across years, so July and August turf quality data are presented (Table 2). Treatments receiving intensive aerification had significantly lower turf quality than the treatments that did not receive aerification. This was likely due to the amount of injury incurred on intensive aerification treatments. Intensively aerified treatments had an average turf quality of 5.9 in both July and August when combined across the three experimental years.

Genetic color had no significant effect for experiment year × aerification intensity interactions when data were combined across years. Genetic color was significantly higher in intensively aerified treatments compared to nonaerified treatments in June, July, and August; intensively aerified treatments averaged 7.7, 7.8, and 7.6 respectively, throughout these summer months (Table 2).

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Rooting was enhanced in treatments receiving moderate aerification at all measured depths (Table 3). Intensively aerified treatments at 0–3 cm below the soil surface averaged 650 mg of roots, while non-aerified turf averaged 450 mg of roots at the same depth. This was the trend for each rooting depth measured throughout the soil profile. Moderately aerified treatments had significantly higher root weight compared to treatments receiving no aerification at all sampling depths.

Intensively aerified turf exhibited severe wilt compared to non-aerified turf (Figure 1). However, spring greenup was enhanced in intensive treatments compared to non-aerified treatments; average spring greenup across experimental years was 6.2 in intensive treatments compared to 4.0 in non-aerified treatments.

Acknowledgments

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Table 1. Aerification information for each year of the study in Olathe, KS

	2020	2021	2022
Aerification date	June 26	June 21	July 8
Core cultivator	John Deere Aercore 800	Ryan Greensaire 24	Verti-Core 1600
Manufacturer	Deere and Company, Moline, IL, USA	Clark Equipment Co., Johnson Creek, WI, USA	Redexim North America, Valley Park, MO, USA
Core depth, in.	2.5	2.0	2.5
Tine diameter, in.	5/8	1/4	3/8

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Table 2. Effect of aerification intensity on turf quality and genetic color in 2020–2022

Aerification treatment[c]	Turf quality[a]		Genetic color[b]		
	July	August	June	July	August
None	7.2a[d]	6.9a	6.1b	6.5b	6.2b
Moderate	7.1ab	6.4ab	7.0ab	7.2ab	6.9ab
Intensive	5.9b	5.9b	7.7a	7.8a	7.6a

[a] Turf quality was rated visually on a 1 to 9 scale on which 1 = dead; 6 = minimally acceptable; 9 = optimum color, density, uniformity, and texture.

[b] Genetic color was rated visually on a 1 to 9 scale on which 1 = brown/straw/dead; 9 = dark green.

[c] Moderate aerification treatments had 63 cores/ft^2, 60 cores/ft^2, and 42 cores/ft^2 pulled in 2020, 2021, and 2022, respectively. Intensive aerification treatments had 126 cores/ft^2, 120 cores/ft^2, and 80 cores/ft^2 pulled in 2020, 2021, and 2022, respectively.

[d] Means followed by the same lower case letter in a column are not significantly different ($P < 0.05$). Means are averages over replication and experimental year, n = 9.

Table 3. Root weights averaged over 2020, 2021, and 2022

Aerification intensity[b]	Sample depth, cm[a]			
	0–3	3–6	6–9	9–12
	Weight, mg[c]			
None	450b[d]	41b	10b	8[e]
Moderate	836a	114a	50a	14
Intensive	651ab	98ab	31ab	16

[a] Three cores were pulled at random from each experimental plot on September 24, 2020, October 18, 2021, and September 26, 2022.

[b] Moderate aerification treatments had 63 cores/ft^2, 60 cores/ft^2, and 42 cores/ft^2 pulled in 2020, 2021, and 2022, respectively. Intensive aerification treatments had 126 cores/ft^2, 120 cores/ft^2, and 80 cores/ft^2 pulled in 2020, 2021, and 2022, respectively.

[c] Root weight of oven-dried root samples after 48 h in an electric drying oven at 150°F.

[d] Means followed by the same letter in a column are not statistically different according to Tukey's Honest Significant Difference ($P < 0.05$). Means are averages over replication, core samples, and experimental year, n = 27.

[e] Samples at the 9–12 cm depth were not significantly different.

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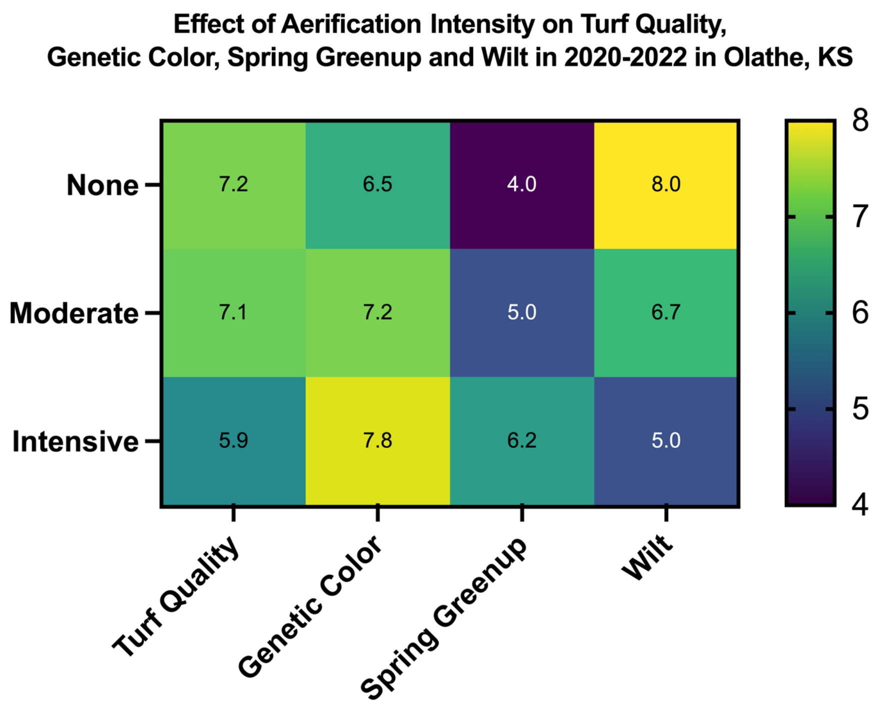

Figure 1. Heat map of aerification intensity effects on visual ratings in 2020–2022.

Figure 2. Ryan Greensaire Aerator used to impose aerification treatments on June 21, 2021.

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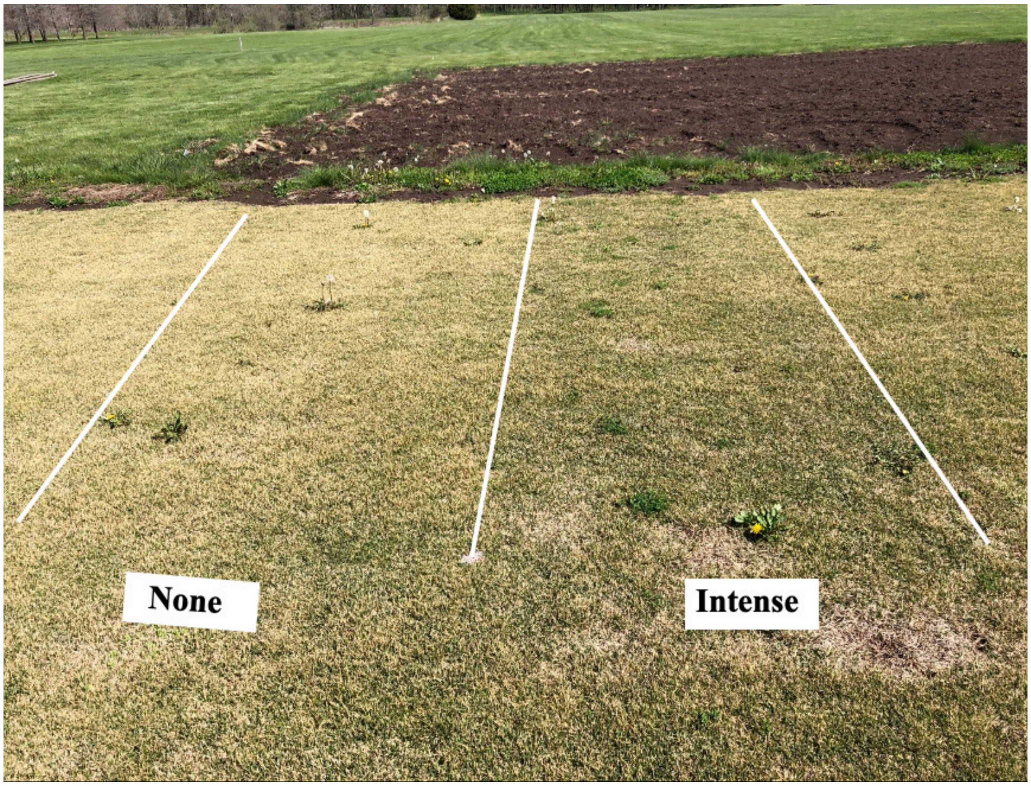

Figure 3. Color differences during spring greenup of treatments in April of 2021.

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