Kansas Agricultural Experiment Station Research Reports

Volume 10
Issue 4 *Turfgrass Research*

Article 2

2024

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Recommended Citation

Ojeokun, Olayemi and Fry, Jack (2024) "Impact of Sod Growers' Grow-in Strategies on the Performance of Zoysiagrass Sod," *Kansas Agricultural Experiment Station Research Reports*: Vol. 10: Iss. 4.
https://doi.org/10.4148/2378-5977.8582

TURFGRASS RESEARCH
2024

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JULY 2024

Impact of Sod Growers' Grow-in Strategies on the Performance of Zoysiagrass Sod

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Summary

Cultural practices such as mowing heights or nutrient application at sod growers' farms can affect zoysiagrass sod performance postharvest and laying. A study conducted with 'Meyer', 'Innovation', and DALZ 1808 involved varying nitrogen levels and mowing heights. The sod, sprigged in June 2021 at the Olathe Horticultural Research and Extension Center (OHREC), was harvested in the summer of 2023 and laid at OHREC and Rocky Ford Turfgrass Research Center (RFTRC), Manhattan, Kansas. Results showed that aerification before sodding reduced the normalized difference vegetation index (NDVI) and quality of DALZ 1808 but not Meyer and Innovation. RFTRC has a Chase silty clay loam with a pH of 7.1 while OHREC has an Oska-Martin silty clay loam with a pH of 6.0. Meyer developed an extended root length than Innovation and 1808 in Manhattan, after nine days of sodding and a lower mowing height at grow-in increased the root numbers in Olathe. After a drought period, Meyer was significantly stressed in Olathe compared to Innovation and DALZ 1808. Overall, aerification may adversely affect some zoysiagrass genotypes and growers' practices may impact the rooting and turf quality of the sod.

Objective

The objective of this research was to evaluate the influence of sod growers' grow-in practices on the performance of zoysiagrass after sodding.

Study Description

Three zoysiagrass cultivars (Meyer, Innovation, DALZ 1808) were sprigged at OHREC in June 2021 for an experiment on management practices influencing grow-in. Treatments included high and low nitrogen levels, and high and low mowing heights. Experiments were conducted at RFTRC and OHREC, each with

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a split-plot design. Sod planting, maintenance, and data collection were all done in 2023.

At OHREC, Meyer zoysiagrass at fairway height underwent glyphosate treatment and was stripped using a Ryan sod cutter at a depth of 1 inch on May 23, 2023. Aerification was done May 24 using a Ryan GreenSaire 24 with 0.5-in hollow tines at a depth of 2 inches and 30 holes/ft^2. A starter fertilizer 24-25-4 (N-P_2O_5-K_2O) [Scotts Turf Builder Starter Food for New Grass (Scotts Miracle-Gro Company, Marysville, OH)] equivalent to 1.5 lb N/1,000 ft^2 was broadcasted to both plots. Sod was cut using a Ryan Sod cutter (Ryan, Johnson Creek WI) and laid in a brick-like pattern, irrigated for 45 minutes, and rolled to ensure firm contact with the soil. Mowing commenced on May 30 at a height of 1.5 in. with a walk-behind rotary mower. The sods were mowed at a height of 1 in with a triplex reel mower [Toro Greensmaster 1000 (The Toro Company, Bloomington, MN)] in two directions, north/south and west/east. Subsequently, mowing was reduced to 0.75 inches with a reel mower [Toro Reelmaster 3100D, The Toro Company, Bloomington, MN.] by the fifth week after sodding. Fertilization was applied using urea (24-0-8) with NS-54 [Anderson Professional Turf Fertilizer, (The Andersons Inc., Maumee, OH)] at 1 lb N/1,000 ft^2. Fenoxaprop-p-ethyl (2-(4-((6-chloro-2-benzoxazolyen) oxy)penoxy) propanic acid, ethyl ester), acclaim herbicide by Bayer Environmental Science, a postemergence herbicide was applied to control annual and perennial grass weeds (crabgrass, goosegrass, and bermudagrass) at 30 fl. oz/a on June 28. On July 5, a combination postemergence broadleaf herbicide, quinclorac 8.43%, sulfentrazone 0.69%, 2,4-D 11.81%, and dicamba 1.49% [Q4 Plus, (PBI/Gordon Corporation)] was applied at 2.5 fl. oz/1,000 ft^2. Irrigation was scheduled for 25 minutes every other day and was intermittently adjusted based on wilt symptoms However, irrigation was adjusted to 1 inch thrice a week during the dry-down week, between August 20 to August 31. Collection of NDVI and turf quality rating continued until November 3, 2023 when the cultivars went into dormancy.

At the RFTRC, Meyer zoysiagrass at fairway height underwent various treatments starting with glyphosate (N-(phosphonomethyl) glycine) Roundup application on May 30 to prevent Meyer competition with experimental cultivars. On June 13, it was stripped using a Ryan Jr. sod cutter [Ryan, Johnson Creek WI] at 1-in, while the aerified plot was aerified with Plugr PL800 (IMSCORP, Lincoln, NE) with 0.6-in. hollow tines at 1.5 in. deep on the same day. A starter fertilizer 24-25-4 (N-P-K) [Scotts Turf Builder, (Scotts Miracle-Gro Company, Marysville, OH)] was broadcasted on June 14, and sod harvested from the grow-in at OHREC was laid at RFTRC, arranged in a bricklike pattern. Irrigation was applied for 45 minutes to ensure moisture for rooting, with subsequent light and frequent irrigation in the first week.

Mowing commenced on June 20 at 1.5 in. using a walk-behind rotary mower [Honda HRX 217, (American Honda Motor Company, Inc., Torrance, CA)] at 1.5 in. (3.8 cm) to prevent scalping. By June 28, mowing was reduced to 1 in. in

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two directions, twice a week for 2 weeks with a reel mower [Hustler FJ 50 greens (Hustler, Hesston, KS)], then adjusted to 0.75 inches three times a week from July 12 onward. 9days after sodding, one foot of each plot was cut and flipped and we measured the average root length and number of emerging new roots in each plot. Postemergence herbicide, Fenoxaprop-p-ethyl [(+)-ethyl 2- [4- [(6-chloro-2 benzoxazolyl) oxy] phenoxy] propanoate - Acclaim Herbicide (Bayer Environmental Science)] was applied on July 18 and August 8 at 0.64 oz/1,000 ft^2 to control weeds. Fertilizer was applied on July 27 with urea (24-0-8) with NS-54 coated slow-release nitrogen [Anderson Professional Turf Fertilizer, (The Andersons Inc., Maumee, OH)] at 1 lb. N/1,000 ft^2 and irrigation was applied every other day for 25 minutes. Plots in Manhattan were subjected to 3 weeks of dry-down from August 22 to September 8, with continued irrigation three times a week. NDVI and TQ visual ratings were reduced to every other week until November 3 when the sods went into dormancy.

Results

In both Olathe and Manhattan studies, significant variations were observed in aerification and cultivar interactions. Turf quality differed among all cultivars, with notable effects of aerification, mowing height, and fertilizer rates on NDVI, particularly in Olathe. In Manhattan, significant differences were observed in mowing height-fertilizer interactions for NDVI.

Interactions between cultivation, aerification, and date significantly influenced turf quality, particularly in the cultivars DALZ 1808 and Innovation. Turf quality remained consistently higher in Manhattan compared to Olathe, attributed to differences in sodding dates and recovery from cold stress.

Root length showed no significant differences across OHREC's variable interactions, while variations were observed among cultivars in RFTRC. Meyer exhibited the longest root length, followed by Innovation and DALZ 1808. In Olathe, low mowing height resulted in higher root numbers compared to high mowing height, whereas no statistical differences were observed in Manhattan.

No significant differences were noted in weed infestation across locations. However, cultivar variations were observed in Manhattan for yellowing and leaf discoloration, contrasting with Olathe's consistent results. Drought stress had minimal impact in Manhattan but significantly affected cultivars in Olathe.

Conclusion

In the first week of sodding, turf quality was notably higher in Manhattan compared to Olathe, likely due to a delayed harvest. Sod harvested for Manhattan had already begun recovering from cold stress, resulting in superior quality and NDVI compared to Olathe's earlier-harvested sod still in recovery. Core aerification significantly impacted DALZ 1808's NDVI and quality in both locations, with quality showing

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a consistent decline possibly due to genetic factors. Although effective for highly compacted soils, aggressive aerification techniques can disrupt soil structure, aerification is often employed in heavily trafficked areas like golf course tees. Further data collection is planned to assess zoysiagrass sod recuperation following winterkill and cold stress, with a focus on grow-in strategies.

Table 1. 12 total subplots from the grow-in experiment in June 2021. Each cultivar received either 196 kg N/ha/yr or 74 kg N/ha/yr. and 3.8 cm or 1.9 cm mowing heights.

Cultivar	Mowing Height	Nitrogen Fertilization
Innovation	Low	Low
Innovation	Low	High
Innovation	High	Low
Innovation	High	High
DALZ 1808	Low	Low
DALZ 1808	Low	High
DALZ 1808	High	Low
DALZ 1808	High	High
Meyer	Low	Low
Meyer	Low	High
Meyer	High	Low
Meyer	High	High

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Figure 1. (A) Area where zoysia grow-in experiment was sprigged in summer 2021; (B) 'Meyer' zoysiagrass was removed from a fairway-height area at research site and sodded in 1) aerified whole plot and 2) nonaerified whole plot; (C) Sod being laid in Olathe in late May 2023; (D) Data were collected weekly on NDVI and visual quality in Olathe and Manhattan.

Figure 2. (A) A 30 cm area of each plot was cut and flipped to determine the maximum root length and root number. (B) A 6.4-cm diameter ring was used to count root numbers.

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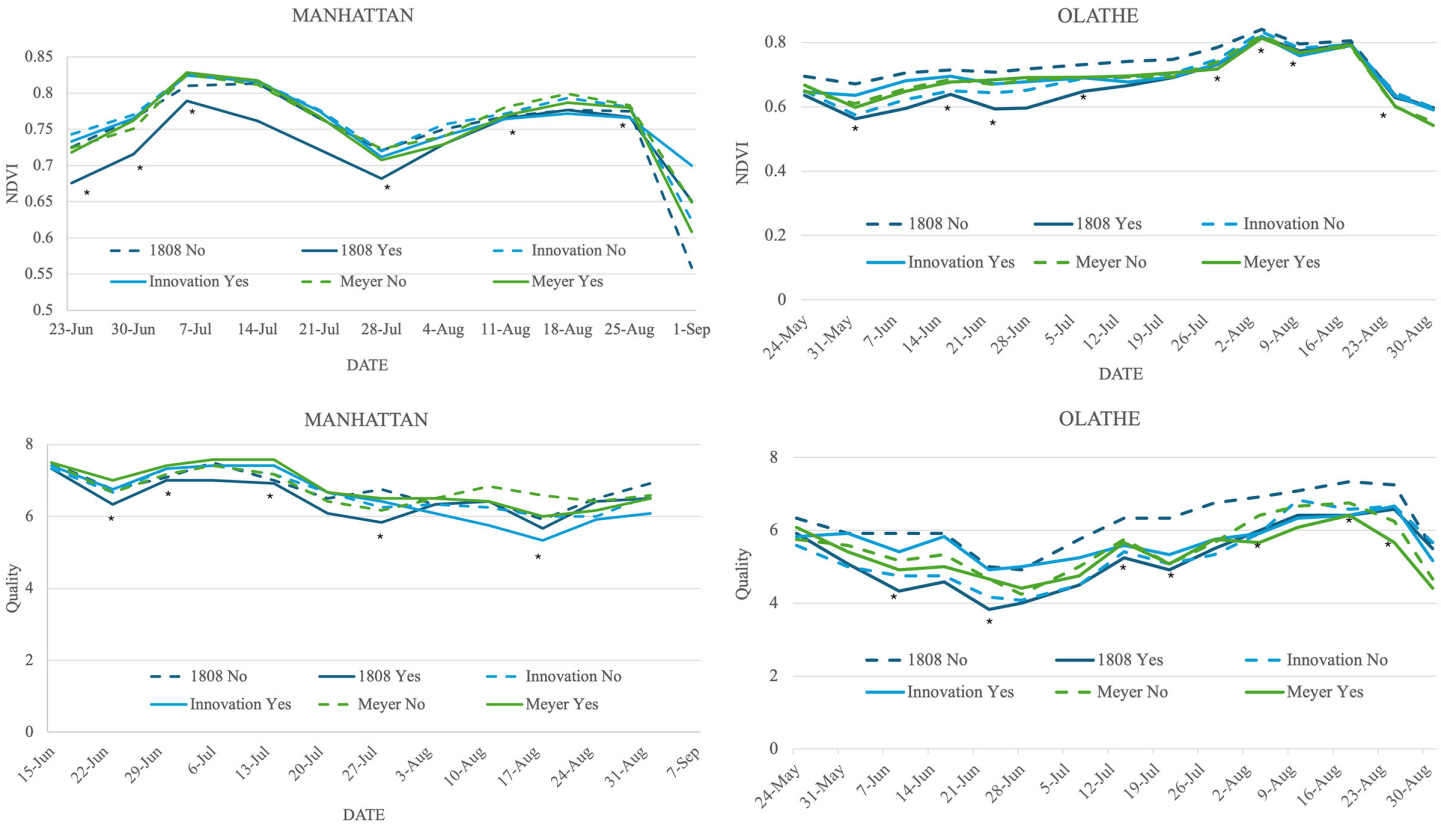

Figure 3. Impact of core aerification on NDVI and visual quality among cultivar ("Yes" after cultivar name refers to soil aerification; "No" is no aerification prior to sodding). Asterisks (*) reflect dates on which aerification resulted in lower DALZ 1808 NDVI or quality after sodding compared to DALZ 1808 on non-aerified soil. Reduction in NDVI and quality in late August in Olathe resulted from occurrence of significant drought stress.

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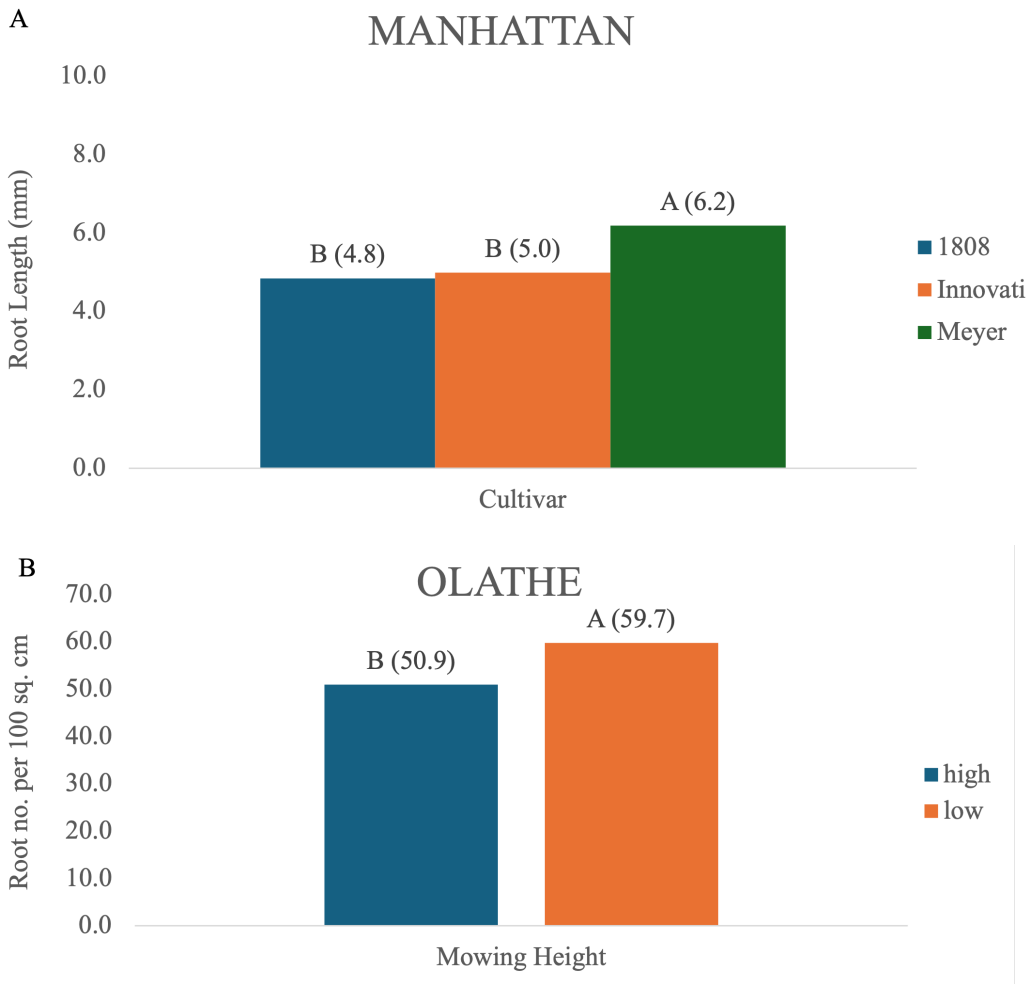

Figure 4. (A) Cultivar effects on root length 9 days after sodding in Manhattan; (B) Mowing height effect on root number 9 days after sodding in Olathe. Different letters above bars indicate statistical differences.

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