CFAES

Department of Horticulture and Crop Science

Impact of Nitrogen Source and Timing on Low-Input Kentucky Bluegrass Lawns

Tyler Carr, Reine Dingui, David Zelaya, & Brynn Johnson

INTRODUCTION

- Nitrogen (N) fertilizer is routinely applied to turfgrass since N is the plant-essential element used in the greatest quantity.[1]
- Frequent applications of quick-release N sources (e.g., urea or ammonium sulfate) can provide consistent turfgrass color and growth; however, it may be impractical for large turf areas due to high labor costs and the limitations of typical lawn care service schedules.
- Slow-release N fertilizers (e.g., polymer-coated urea (PCU), natural organics, etc.) can reduce the frequency of fertilizer applications.[2]
- It remains unclear whether turfgrass can maintain consistent color and growth with only one or two slow-release N applications annually.

OBJECTIVE

To discern the effects of nitrogen source and application timing on Kentucky bluegrass performance in a low-input lawn

MATERIALS AND METHODS

Experimental area

- Location: Ohio Turfgrass Foundation Research and Education Facility, Columbus, OH 43221
- Mature Kentucky bluegrass (*Poa pratensis* L.) lawn
- Weekly mowing at 6.4 cm, with clippings returned
- Irrigation applied only following fertilizer applications (~25 mm yr^{-1})

Treatments

- Initiated May 2023
- All treatments received 98 kg N ha^{-1} yr^{-1}
- 4 fertilizer sources
  - Urea (46-0-0)
  - PCU 44 (44-0-0)
  - PCU 42 (42-0-0)
  - Natural organic (13-0-0)
- Three application timings
  - May (98 kg N ha^{-1})
  - September (98 kg N ha^{-1})
  - May + September (49 + 49 kg N ha^{-1})
- Standard control
  - 24.5 kg N ha^{-1} with urea in May, July, September, and October
- 6.4 mm irrigation applied following each fertilizer application

Data collection

- Dark green color index using digital image analysis was quantified every two weeks (Fig. 1)[3]
- Turfgrass height was assessed every two weeks before mowing using a Turf Height Tester (Fig. 1)[4]

Data analysis

- Experimental design: One-factor randomized complete block design with three replications of each fertilizer treatment
- Dark green color index and turfgrass height were analyzed using PROC GLIMMIX (SAS v. 9.4); treatment means separated with Fisher's protected LSD (α = .05)
- For all dates, slicing was performed in PROC GLIMMIX to identify evaluation dates when treatment effects were significant

Figure 1. Dark green color index was quantified via images collected through a light box (left). Turfgrass height was assessed using a Turf Height Tester (right).

RESULTS

Dark green color index

- In 2023 and 2024, dark green color index was significantly affected by the treatment × evaluation date interaction.
- The greatest magnitude of color response was from May or September applications of 98 kg N ha^{-1} (Fig. 2 & 3).
- Color was most consistent when applying 49 kg N ha^{-1} in May and September (Fig. 2 & 3).
- PCU 42 applied at 98 kg N ha^{-1} in September 2023 had lower fall color than other treatments at the same rate and timing until April 2024 (Fig. 2 & 3).

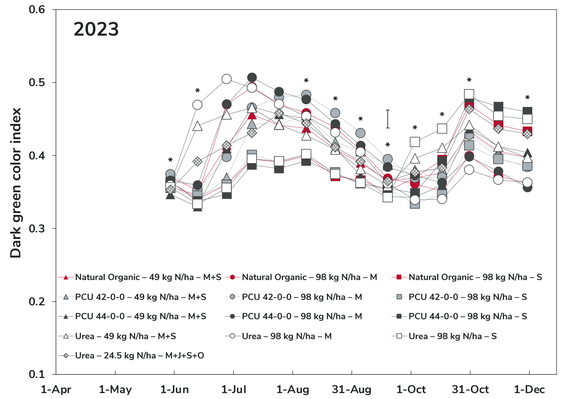

Figure 2. Dark green color index of a Kentucky bluegrass (*Poa pratensis* L.) lawn as affected by nitrogen fertilizer source and application timing in 2023 in Columbus, Ohio. Error bar indicates least significant difference for comparing means, and asterisks denote dates with significant differences among treatments ($P < .05$). M=May; J=July; S=September, O=October.

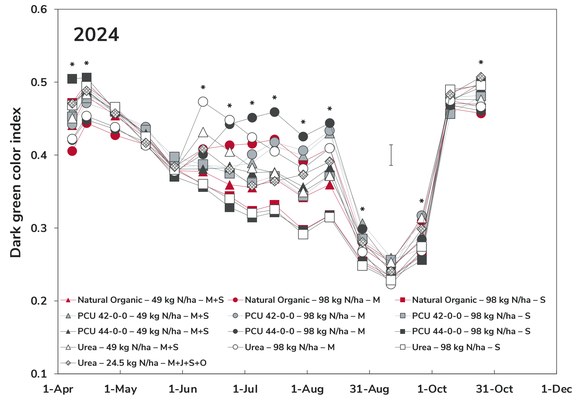

Figure 3. Dark green color index of a Kentucky bluegrass (*Poa pratensis* L.) lawn as affected by nitrogen fertilizer source and application timing in 2024 in Columbus, Ohio. Error bar indicates least significant difference for comparing means, and asterisks denote dates with significant differences among treatments ($P < .05$). M=May; J=July; S=September, O=October.

Turfgrass height

- In 2023 and 2024, turfgrass height was significantly affected by the treatment × evaluation date interaction.
- PCU 44 at 98 kg N ha^{-1} had the greatest summer 2023 growth, which may lead to mower scalping (Fig. 4).
- Turfgrass height from May and September applications of 49 kg N ha^{-1} rarely differed from the standard urea control (Fig. 4 & 5).
- In 2024, treatments differed only in spring and fall, which was likely due to prolonged summer drought conditions.
- Fall turfgrass height was generally unaffected by fertilizer treatments (Fig. 4 & 5).

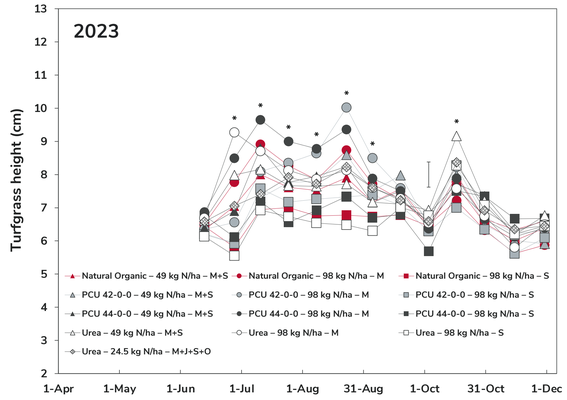

Figure 4. Turfgrass height of a Kentucky bluegrass (*Poa pratensis* L.) lawn as affected by nitrogen fertilizer source and application timing in 2023 in Columbus, Ohio. Error bar indicates least significant difference for comparing means, and asterisks denote dates with significant differences among treatments ($P < .05$). M=May; J=July; S=September, O=October.

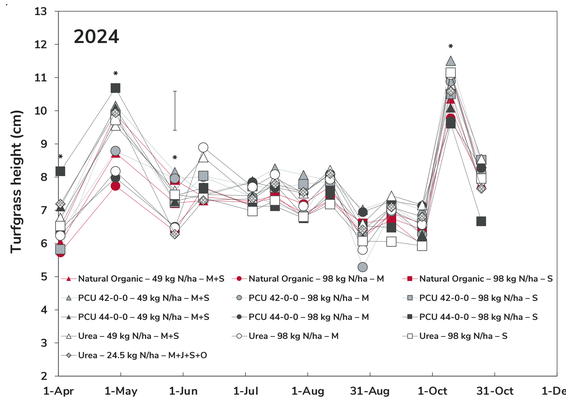

Figure 5. Turfgrass height of a Kentucky bluegrass (*Poa pratensis* L.) lawn as affected by nitrogen fertilizer source and application timing in 2024 in Columbus, Ohio. Error bar indicates least significant difference for comparing means, and asterisks denote dates with significant differences among treatments ($P < .05$). M=May; J=July; S=September, O=October.

CONCLUSIONS

- Single, 98 kg N ha^{-1} applications of any N source in May or September did not provide color or growth consistent with the standard urea control throughout the year.
- Two fertilizer applications may provide year-long color and growth; however, N sources should likely be different for spring and fall applications.
- Data collection will continue through spring 2025.

Climate data
References
Acknowledgements

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

buckeyeturf.osu.edu