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Relationship Between Autumn Verdure Nitrate-N Concentrations and Spring Color in Kentucky Bluegrass

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UCONN TURFGRASS

Introduction

In Northern climates, autumn marks the period when new leaf blade formation in perennial turfgrasses declines because of the onset of winter dormancy. It is during this time that N storage as nitrate should increase at the bottom of the shoots of perennial turfgrasses because of the decline in the amount of N needed for leaf proteins. This stored nitrate may be a significant source of N for the turf plant at the onset of new growth in early spring. A measure of this nitrate pool could be useful for deciding if N fertilizer should be applied to turfgrass in the autumn.

Objective

The objective of this study was to determine if any relationship exists between autumn nitrate-N concentrations in the verdure (all above-ground portions of the turf plant remaining after removal of clippings by mowing) of Kentucky bluegrass and turf color quality in the following spring.

Materials and Methods

- 8-yr old stand of Kentucky bluegrass (*Poa pratensis* cvs. Marquis, Kelly, and Indigo) in 2006-07 and 1-yr old stand of Kentucky bluegrass (America) in 2007-2008.

- N applied as urea on Sept. 22, 2006 and Sept. 14, 2007 at rates of 12, 25, 37, 49, 61, 74, 86, 98, 123, 147, 172, and 196 kg ha^{-1} in RCBD with 3 replicates.

- Autumn Canopy reflectance Spectrum CM-1000 Chlorophyll Meter and TCM-500 NDVI Turf Color Meter on Oct. 4, 13, 22, 30, Nov. 3, 2006; Oct. 1, 7, 15, 22, 29, Nov. 5, 2007.

- Plots mowed at a height of 5 cm using rotary hand mower with bagger to collect clippings. After mowing, verdure samples were removed from each plot down to ground level.

Materials and Methods (continued)

- Verdure tissue samples dried, ground, and extracted with aluminum sulfate solution, and nitrate-N in the extract measured with an ion-selective electrode.

- Spring reflectance taken on March 31, April 7, 14, 21, May 3, 2007; and March 30, April 10, 15, 23, 30, May 6, 2008.

- For each autumn and spring sampling date, relationships between autumn verdure nitrate-N concentrations and spring color were described by the Linear-Response Plateau (LRP) and Quadratic-Response Plateau (QRP) models.

- Relative responses were calculated by dividing each sampling date response by the plateau value for each particular date.

- Relative values from all autumn and spring sampling dates were pooled across years to determine if a critical level for autumn verdure nitrate-N could be found that maximized spring color.

Results

- Spring color was maximized when fall verdure nitrate was between 300 and 600 mg kg^{-1} across all autumn and spring sampling/measurement dates (Figs. 1 and 2).

- Critical concentrations were similar for the CM1000 Chlorophyll and TCM500 NDVI Turf Color meters.

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Conclusions

- The results suggest that autumn verdure nitrate-N concentrations may be used to determine maximum turf color quality (as measured using reflectance meters) of Kentucky bluegrass turf in the spring following winter dormancy.

- The autumn verdure nitrate test may be useful for guiding N fertilization in the autumn for perennial turfgrasses in northern climates.

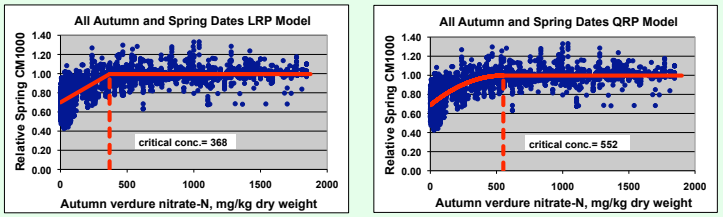

Fig. 1. Relationship between autumn verdure nitrate-N concentrations and spring color as measured with Spectrum CM1000 Chlorophyll meter pooled across autumn and spring periods of 2006-07 and 2007-08. Critical autumn verdure nitrate-N concentrations are 368 mg kg^{-1} dry weight for the Linear-Response Plateau (LRP) model and 552 mg kg^{-1} dry weight for the Quadratic-Response Plateau (QRP) model.

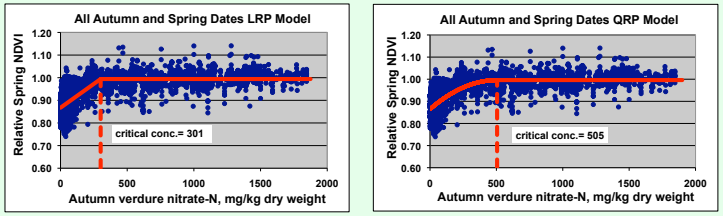

Fig. 2. Relationship between autumn verdure nitrate-N and spring color as measured with Spectrum TCM500 NDVI Turf Color meter pooled across autumn and spring periods of 2006-07 and 2007-08. Critical autumn verdure nitrate-N concentrations are 301 mg kg^{-1} dry weight for the Linear-Response Plateau (LRP) model and 505 mg kg^{-1} dry weight for the Quadratic-Response Plateau (QRP) model.