

Evaluation of Fertilizer Application Strategies for Preventing or Recovering from Large Patch Disease of Zoysiagrass

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Objectives:

1. Determine the influence of nitrogen source on the growth and biology of the large patch pathogen.
2. Evaluate the impact of fertilization with different nitrogen sources on the large patch incidence and disease recovery in the greenhouse and field.

Large patch caused by *Rhizoctonia solani* AG2-2 LP is a perennial disease that causes severe damage on zoysiagrass fairways in the United States transition zone. Control of this disease is difficult, and reliant on preventive fungicide applications in the fall and oftentimes again in the spring to achieve adequate control. Nitrogen fertilization during large patch development has been discouraged since brown patch in cool season turfgrasses, caused by a different *R. solani* anastomosis group, is more severe in over-fertilized turf. Recent research from Kansas State University, however, found fertilization with urea during the spring and fall resulted in less large patch severity. This information, along with the dramatic impact that ammonia-based nitrogen fertilization has had on reducing severity of diseases such as take-all patch and summer patch, necessitates a more thorough examination of nitrogen fertilization practices and the large patch pathosystem. The objectives of this research are to 1) determine the influence of nitrogen source on the growth and biology of the large patch pathogen, and 2) evaluate the impact of fertilization with different nitrogen sources on the large patch incidence and disease recovery in the greenhouse and field.

Laboratory assays utilizing either calcium nitrate or ammonium sulfate as sole nitrogen sources have consistently demonstrated morphological changes (hyphal pigment loss) of different isolates of the large patch pathogen. Greenhouse studies are being conducted to determine if these morphological changes subsequently result in a loss or reduction in pathogen virulence. In 2013, a 3-year field experiment was initiated at the University of Missouri in Columbia, MO and Kansas State University in Manhattan, KS. Urea, calcium nitrate, and ammonium sulfate were applied to asymptomatic



Recent research at Kansas State University and University of Missouri indicate that nitrogen fertilizer source can influence the severity of large patch on zoysiagrass.

zoysiagrass at 0.75 lb N/1000 sq ft when 5-day soil temperature averages taken at the 2" depth were either 60°F or 70°F in the spring, or 70°F in the fall. A standard control program consisted of urea at 0.5 lb N/1000 sq ft in June, July, and August, with treated plots receiving 0.25 lb N/1000 sq ft, for a total of 1.5 lb N/1000 sq ft applied to each plot per annum.

At both sites, more treatment differences were observed in 2014 than 2013, however, no nitrogen source or timing has stood out yet as a particularly effective treatment. At the KSU site, ammonium sulfate resulted in

higher green cover % than calcium nitrate on a few rating dates, but not higher than the standard program (Figure 1). At the MU site, area under the disease progress curve for the 2014 spring disease epidemic was highest in plots treated with the standard program, but was not statistically different from other nitrogen source treatments or timings (Figure 2). A second field experiment was initiated in fall 2014 investigating the impact of timing, continued use of the same nitrogen source throughout the summer, and integration of a single spring fungicide application into a large patch control program (Figure 3).

Summary Points:

- Growth of the large patch pathogen, and therefore disease severity, may be impacted by choice of nitrogen fertilizer.
- Field experiments at two sites have demonstrated no increase in large patch severity with fall or spring fertilizer applications compared to a standard summer fertility program.
- Overall usage of a particular N source may need to be sustained over a longer time frame to result in a reduction in large patch severity.

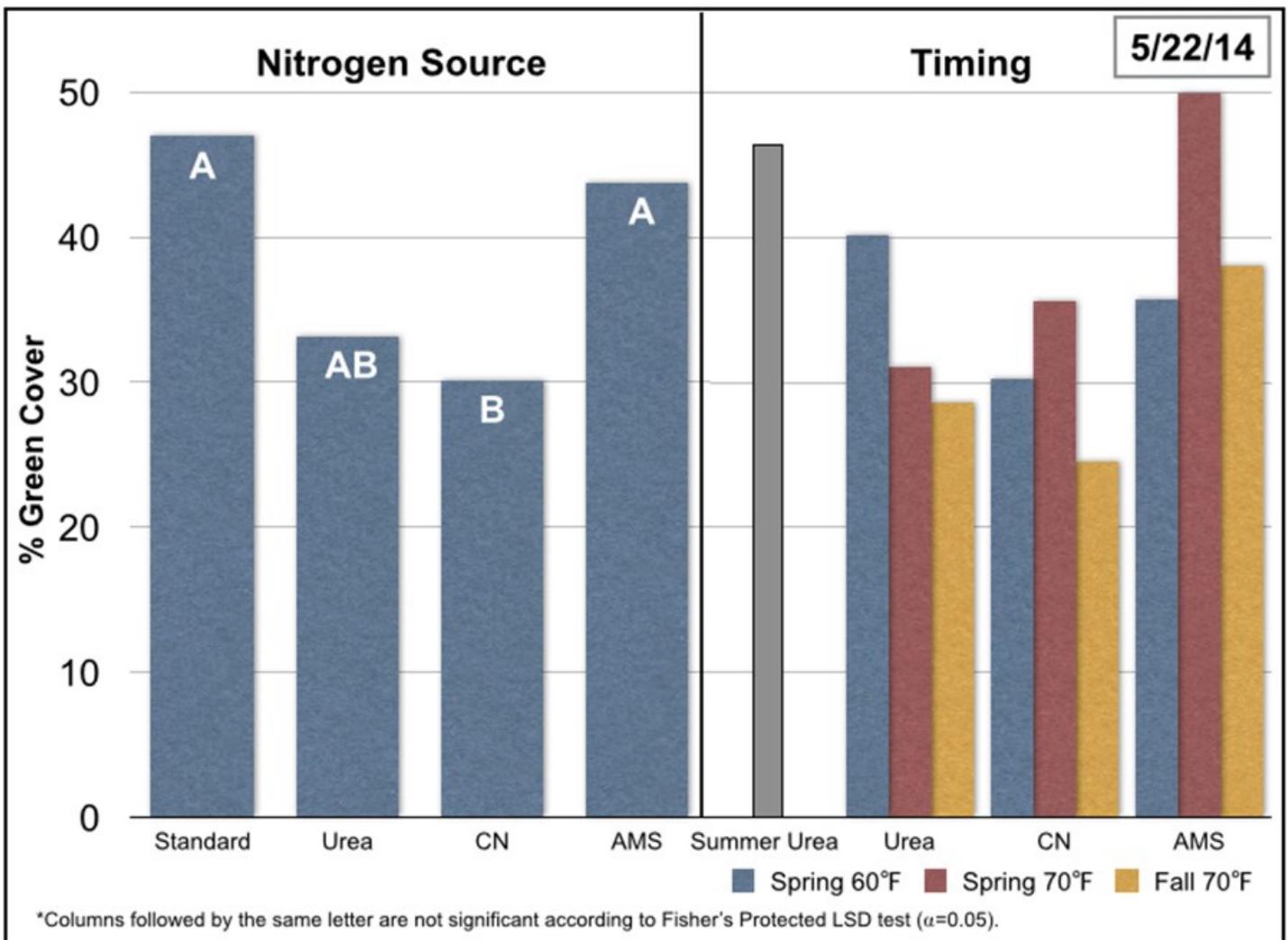


Figure 1. Kansas State University Data: Percent green cover in field experiment as impacted by N source and timing on large patch on 5/22/14. Significant differences were detected among N sources on only a few rating dates and not overall. Similarly, no consistent differences were detected among fertilizer timings. Green cover was assessed through digital image analysis of plots. CN and AMS represent calcium nitrate and ammonium sulfate treatments, respectively. Adapted from Ross Braun, M.S. Thesis: Kansas State University.

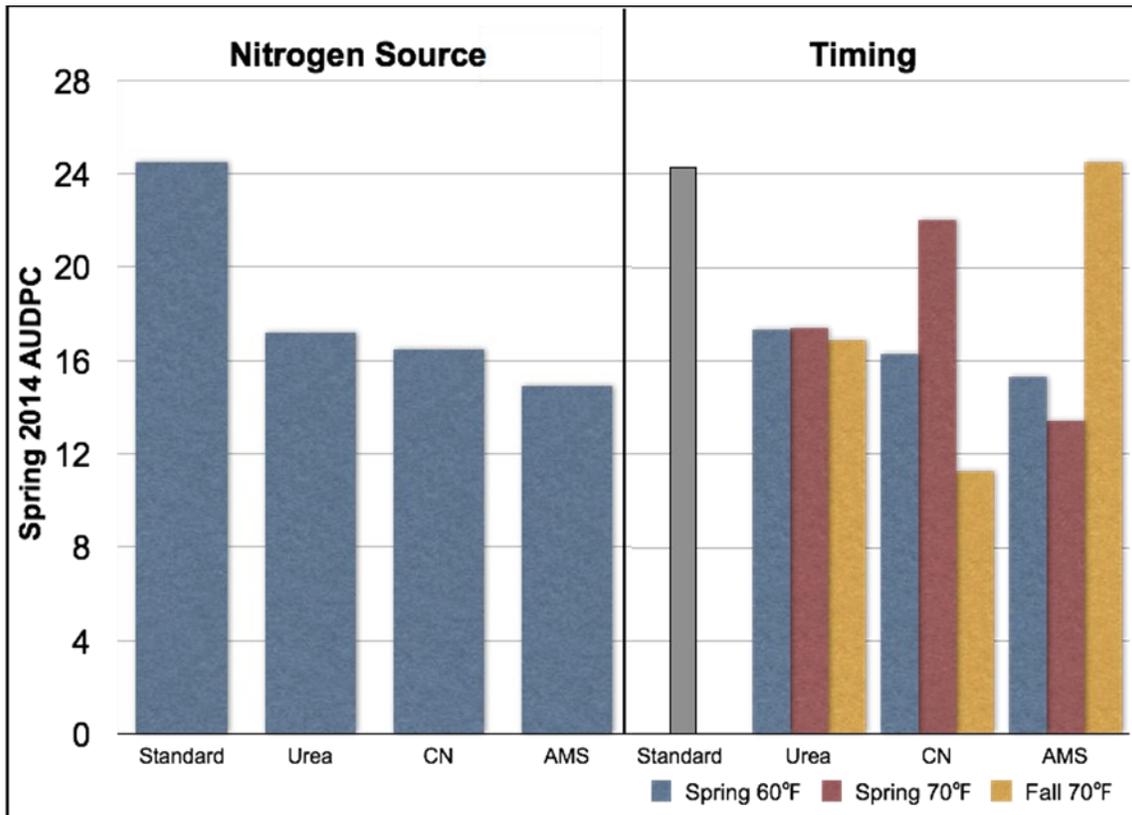


Figure 2. University of Missouri Data: Disease severity in field experiment examining the impact of N Source and timing on large patch. AUDPC indicates area under the disease progress curve, a measure of the collective large patch severity over the course of the spring 2014 season (4/30-6/26: calculated by the trapezoidal rule). CN and AMS represent calcium nitrate and ammonium sulfate treatments, respectively. No significant differences among treatment means have been detected in this study.

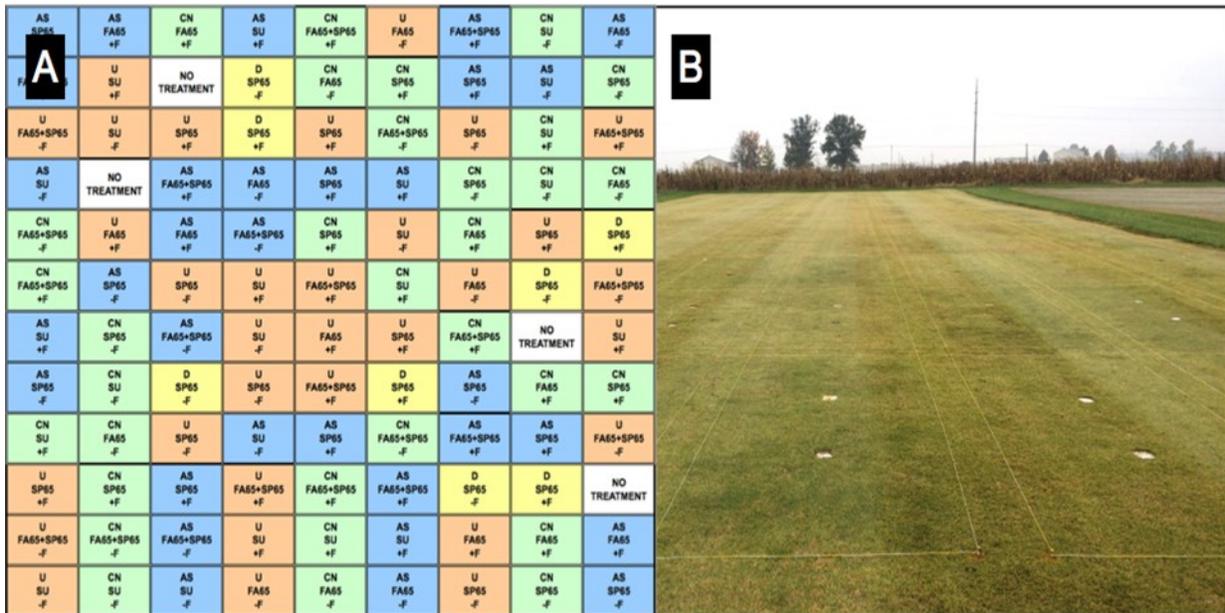


Figure 3A & 3B. Plot plan and photo of new field research plot further investigating the impact of nitrogen source (urea vs. calcium nitrate vs. ammonium sulfate), timing (Standard vs Fall—65° vs. Fall+Spring—65°) and fungicide application (+ or -) on large patch disease severity.