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

G. L. Miller and B.F. Fresenburg, University of Missouri
M. Kennelly, Kansas State University

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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. In addition, preliminary lab studies conducted at the University of Missouri indicates a NH_4–nitrogen source causes a morphological change in R. solani AG2–2 LP isolates that may indicate a reduction in pathogen virulence (see Figure 1). 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.

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

Over 40 isolates of *R. solani* AG2–2 LP have been collected from large patch infested zoysiagrass fairways and lawns in Missouri and Kansas. Growth of these isolates will be assessed in the laboratory on amended media to determine if they also lose pigment when exposed to a NH_4–nitrogen source. Additionally, zoysiagrass is being established via sterile sprigs in greenhouse plots to test the pathogenicity of large patch isolates that

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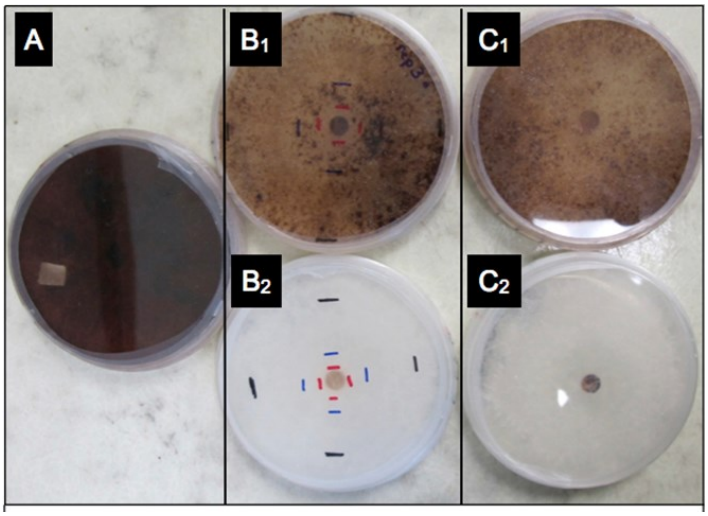

Nitrogen fertilization source indicates a NH_4–nitrogen causes a morphological change in *Rhizoctonia solani* AG2–2 LP isolates that may indicate a reduction in pathogen virulence.
A: Potato dextrose agar (control)
B_1 : 200 ppm $CaNO_3$ B_2 : 200 ppm NH_4SO_4
C_1 : 800 ppm $CaNO_3$ C_2 : 800 ppm NH_4SO_4

are preconditioned with NH_4. In 2013, a 2–3 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 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. Untreated plots received urea at 0.5 lb N/1000 sq ft in June, July, and August, while treated plots received 0.25 lb N/1000 sq ft, resulting in 1.5 lb N/1000 sq ft applied to each plot per annum. At the Columbia site, plots were inoculated on May 1 prior to fertilization with 25 cc of rye grain infested with *R. solani* AG2–2 LP per plot. The study in Kansas was established at a site with a history of large patch from prior inoculations using infested oats in fall 2011. This site was re–inoculated in fall 2013 to ensure continued disease pressure. In October 2013, no significant differences in disease severity were noted among treatments or application timings (Figure 2). Similarly at the Kansas site, no significant effects of fertility were observed during spring 2013.

Summary Points

- Growth of the large patch pathogen, and therefore disease severity, may be impacted by choice of nitrogen fertilizer.
- Researchers at the University of Missouri and Kansas State University have acquired preliminary results that indicate nitrogen applications during the spring and/or fall may impact large patch severity.
- Fertilizer choice and timing may play an integral role in an overall IPM strategy for the future management of large patch of zoysiagrass.

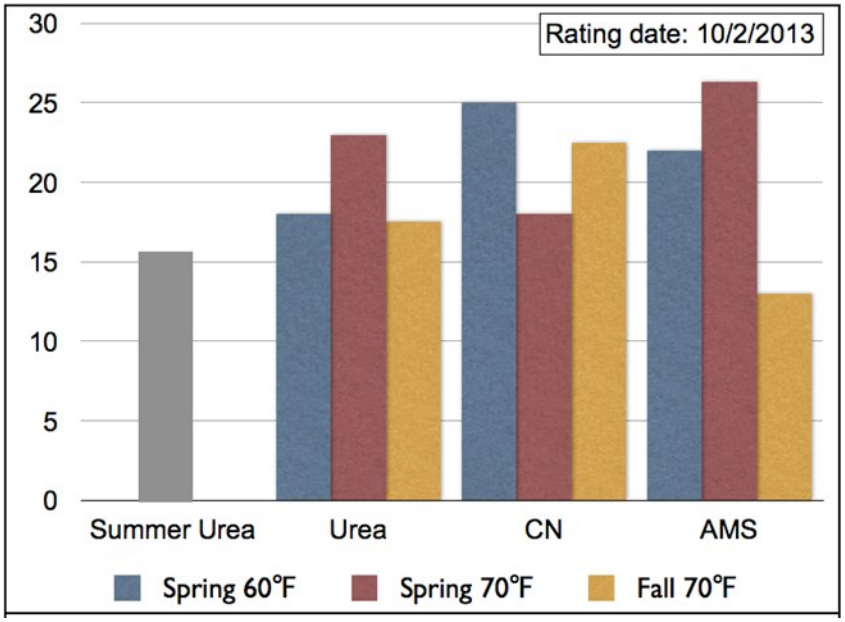

Figure 2. Disease severity in field experiment examining the impact of N source and timing on large patch. CN and AMS represent calcium nitrate ($CANO_3$) and ammonium sulfate (NH_4SO_4) treatments, respectively. No significant differences among treatment means were detected in the first fall rating period of the study.

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