Cultural Practices, Environment, and Pathogen Biology: Studies for Improved Management of Large Patch of Zoysiagrass

Megan Kennelly, Jack Fry, Rodney St. John, and Dale Bremer
Kansas State University

Objectives:

1. Determine the effects of aeration, verticutting, and sand topdressing on large patch (*Rhizoctonia solani* AG 2-2 and investigate the biology of the interaction of cultural practices and disease.
2. Determine the effects of nitrogen source and time of application on disease development.
3. Study the environmental conditions associated with disease development in the field.
4. Compare large patch susceptibility of 34 new freeze-tolerant zoysiagrass genotypes.
5. Study the effects of different preventive fungicide application timing and correlate with weather conditions to develop better guidelines for fungicide deployment.

Start Date: 2008
Project Duration: 3 years
Total Funding: $46,806

Large patch, caused by *Rhizoctonia solani* AG 2-2, is the most common and severe disease of zoysiagrass in the transition zone. Knowledge is lacking about the interaction of cultural techniques, weather, and disease development. We are conducting field experiments at several sites to elucidate the influence of cultivation practices on large patch, and we will monitor the effects of weather on disease development.

Another key goal is to determine the large patch susceptibility of new zoysiagrass progeny (*Z. japonica* x *Z. matrella*) that may be alternatives to 'Meyer', the most commonly used cultivar in the northern transition zone. We are also investigating fungicide application timing and will correlate it with environmental data to develop a model for optimal fungicide deployment.

In 2010, we carried out the third year of cultural and fertility practices for objectives 1 and 2. Plots were established at three sites (Manhattan, Olathe, and Haysville, KS) in 2008. At all three sites, the experiments are set up as a split-plot with four replications. The main treatment plots are 12 x 20 feet. The main treatments are cultivation (aerification + verticutting + topdressing) versus noncultivated. The subplot (12 x 10 feet) is fertility, either spring + fall or summer fertilization. For the spring + fall treatment, plots were treated with 1 lb N/1,000 ft^2 as urea (46-0-0), in both spring and fall.

The summer treatment was 2.0 lb N/1,000 ft^2 as polymer-coated urea. To induce disease development, all plot areas were inoculated in September 2008 by taking out small turf cores, inserting *R. solani*-infested oats, and replacing the cores. Patch size was determined in spring 2010 by measuring patch size and by using digital image analysis to determine the amount of blighted tissue within the patch. The cultivated/summer fertility plots had slightly smaller patch sizes, but the spring/fall fertilized plots tended to recover faster (faster return to green tissue in the digital analysis).

We deployed temperature and wetness sensors in several experimental plots. There were no differences in thatch-level temperature between cultivated and noncultivated plots. Water content was slightly lower in the cultivated plots on some dates.

Thirty-four zoysiagrass lines were propagated in the greenhouse. Due to ongoing progress in another study by Dr. Fry, the lines of interest (primarily *Z. japonica* x *Z. matrella*) were narrowed down to 20. Inoculations were performed once the turf was established for 5 months after propagation from stolons. The inoculations were conducted in a growth chamber, and sheath blight symptoms were rated for disease severity. In addition, the new progeny were evaluated in field plots in Manhattan by measuring patch size and through digital analysis.

Seven of the lines evaluated in the growth chamber had disease severity value less than that obtained for 'Meyer', the most commonly used zoysiagrass cultivar in our region. Unfortunately, results in the growth chamber did not correlate to results in the field. One promising result is that the new progeny, which have a *Z. matrella* parent, were not significantly worse than 'Meyer' (*Z. japonica*), as is the case with some cultivars of *Z. matrella*. Some progeny appear to recover from symptoms more quickly than 'Meyer'. The field study is being repeated in Olathe. Plots were inoculated in September, 2010 and will be evaluated in May, 2011.

Patch size was determined in spring 2010 by measuring patch size and by using digital image analysis to determine the amount of blighted tissue within the patch.

Summary Points

- Increase of patch size was highest in noncultivated plots with spring + fall fertility.
- However, patches recovered slightly faster in the spring/fall fertility.
- Water content was slightly lower in cultivated plots, possibly reducing disease severity.
- Unfortunately, growth chamber testing does not appear to be a strong indicator of field susceptibility to large patch.
- In the field, some of the progeny recovered from symptoms more quickly than 'Meyer'.