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

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Objectives:

1. Determine the effects of aeration, verticutting, and sand topdressing on large patch 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 preventative fungicide application timing and correlate with weather conditions to develop better guidelines for fungicide deployment.

Start Date: 2008
Project Duration: three 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 investigate these interactions. In preliminary experiments, spring aeration, verticutting, and sand topdressing surprisingly led to higher levels of large patch. As work progresses, we will better elucidate the influence of cultivation practices on large patch, and we will monitor the effects of weather on disease development. We will also investigate fungicide application timing and correlate it with environmental data to develop a model for optimal fungicide deployment if fungicides are used.

In 2009, we carried out the second year of cultural and fertility practices for Objectives 1 and 2. Plots were established at three sites (Manhattan, Olathe, and Haysville, KS). 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 (aeration + verticutting + topdressing) vs non-cultivated. The subplot (12 x 10 feet) is fertility, either spring + fall or summer fertilization. For the spring + fall treatment, plots were treated with 1 pound N/1,000 ft^2 as urea (46-0-0), in both spring and fall.

The summer treatment was 2.0 pound 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 2009 by measuring two diameters of each patch (north-south and east-west) and taking an average.

There were no differences in thatch-level temperature between cultivated and non-cultivated plots. Water content was slightly lower in the cultivated plots. This supports our hypothesis that cultivation will reduce moisture and possibly reduce disease pressure.

We initially propagated 34 zoysiagrass lines in the greenhouse. Due to ongoing progress in another study by Dr. Fry, the lines of interest were narrowed down to 20. That is, in Dr. Fry's other study examining cold tolerance, quality, color, texture, etc, the "progeny of interest" have been reduced. The zoysiagrass is propagated vegetatively. Inoculations were performed once the turf was established for 5 months. The inoculations were conducted in a growth chamber and sheath blight symptoms were rated for disease severity.

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. The growth chamber study will be repeated in early 2010. Analysis of field inoculations is in progress, and we will compare field and growth chamber studies.

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Experiments were conducted as randomized complete block designs with four replicates for each treatment in an inoculated stand of zoysiagrass at the Rocky Ford Turf Center. Prostar (flutolanil) was applied on various dates and disease incidence was measured in spring 2009. For single applications, the best results were obtained with applications on September 16 and 23.

Summary Points

- Increase of patch size was highest in non-cultivated plots with spring+fall fertility.
- Water content was lower in cultivated plots, possibly reducing disease severity.
- Growth chamber work indicates some variation in susceptibility. Experiments will be repeated and compared with field studies.
- Differences in disease control were observed with different fungicide application timings.