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. In this project, 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 spring and fall 2008, we started to build our collection of large patch isolates to use in further studies. We currently have 60 isolates, stored on oat seeds, for long-term stability.

We carried out the first set of cultural and fertility practices for Objectives 1 and 2. Plots were established at 3 sites (Manhattan, Olathe, and Haysville, KS). At all 3 sites, plots are set up as a split-plot with 4 replications. The main treatment plots are 12 x 20 feet. Treatments are cultivation (aeration + verticutting + topdressing) versus non-cultivated. The subplot 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.

Large patch, caused by Rhizoctonia solani *AG 2-2, is the most common and severe disease of zoysiagrass in the transition zone.*

The summer treatment was 2 lbs 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 cores, inserting large-patch-infested oats, and replacing the cores. Disease will be assessed in spring 2009.

We deployed temperature and wetness sensors in several experimental plots in fall 2008. The data will be analyzed this winter, and the same type of measurements will be taken in the coming seasons.

We have started to propagate the 34 zoysiagrass lines in the greenhouse. The zoysiagrass is propagated by taking 2-3 node sections of stolons and placing in a soilless potting mix under mist for several weeks, then transferring to the greenhouse.

In addition, field plantings of the zoysiagrass progeny were inoculated in both Manhattan and Olathe. Disease symptoms were apparent in some plots this fall. Disease will be assessed in the spring, along with time-to-recovery.

We established fungicide timing trials at two sites, an inoculated site at our research facility and a naturally-infested area at a local golf course.

Summary Points

- First set of cultural practices was carried out and plots inoculated for disease ratings in spring 2010.
- Zoysiagrass progeny were inoculated in the field, and plant material is being multiplied in the greenhouse.
- Fungicides were applied for first timing experiments, and disease will be rated next spring.