



# Screening Tall Fescue Ecotypes for Brown Patch Resistance

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## Introduction

Tall fescue (*Festuca arundinacea* Shreb.) is primarily planted as a permanent species in home lawns and roadsides in the transition zone of the United States. However, brown patch (*Rhizoctonia solani* Kuhn.) is a disease that can be devastating to permanent stands of tall fescue. Research conducted by Bokmeyer et al. (2009) and Watkins et al. (2009) suggests that brown patch resistance in tall fescue is a quantitative trait controlled by mostly additive gene action and is strongly affected by the environment. Wild ecotypes of tall fescue can be found growing throughout the north and central regions of Mississippi. This state has the hot humid climate that should be ideal to provide disease pressure for natural selection against brown patch.

## Objective

The objective of this research was to determine if wild germplasm collected in Mississippi varied in resistance to brown patch. If so, resistant genotypes could be used in future cultivar development with improved brown patch tolerance.

## Materials and Methods

In 2013, tall fescue ecotypes were collected from cemeteries in central MS where centipedegrass (*Eremochloa ophiuroides* [Munro.] Hack.) was the predominant species of mowed turf (Photo 1). The collected plants were grown under greenhouse culture and divided into three replicates for disease screening. Thirty-six genotypes, including six standard cultivars, and 30 ecotypes were inoculated with *Rhizoctonia solani* (AG-1-IB) (Tomaso-Peterson and Trevathan, 2007). *Rhizoctonia*-infested corncob grit was placed at the base of tall fescue stems at the rate of 0.5 grams per pot (Photo 2). The plants were transferred to a humid chamber (25°C; 99% rel.hum.) for 48 hours (Photo 3).

Two weeks later tall fescue plants were once again transferred to the humid chamber as previously described. Weekly disease ratings were based on a visual scale of 1 to 9, where 1 = dead and 9 = no disease. Data were subjected to cumulative analysis as area under the disease progress curve (AUDPC).



Photo 1. Tall fescue ecotypes were collected in MS at sites located between 33.31-33.54° north, and 88.77-89.22° west.

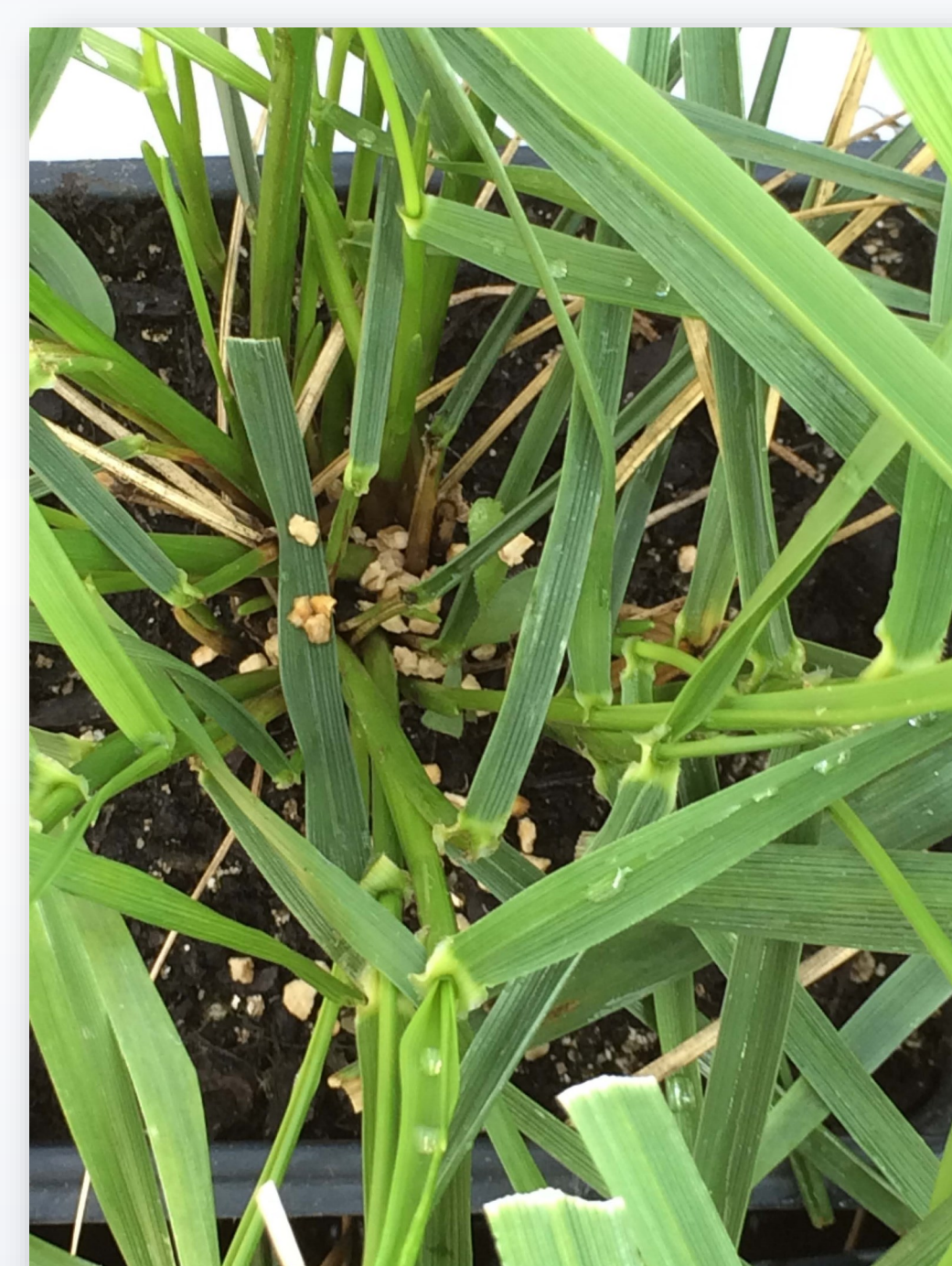


Photo 2. Each genotype was inoculated with *Rhizoctonia*-infested corncob grit.



Photo 3. Plants were placed in a humidity chamber after inoculation.



Photo 4. The tall fescue ecotype collection included a wide range of plant height, color, and leaf texture.



Photo 5. Tall fescue selections displayed differences in susceptibility to brown patch disease.

Table 1. Tall fescue selections rated for brown patch symptoms at Mississippi State University in 2013.

Cultivar /genotype	AUDPC <sup>†</sup>
25	18.5
4	18.3
27	18.0
26	17.7
13	16.8
30	16.8
11	16.8
1	16.3
Mustang 4	16.3
18	16.2
19	16.0
Wolfpack II	16.0
8	15.8
7	15.8
6	15.7
Talladega	15.5
Faith	15.3
9	15.2
2	15.2
24	14.3
12	14.3
10	14.3
28	14.2
Plato	14.2
5	14.2
21	14.2
15	13.8
22	13.8
Hunter	12.5
29	12.5
31	12.2
20	12.2
16	12.0
17	11.7
23	11.3
3	6.3
LSD(0.05)	4.1

<sup>†</sup>Area under disease progress curve resulted from a 1 to 9 visual rating, where 1= dead and 9 = no symptoms. Five ratings were conducted over a four-week period.

## Results

The tall fescue ecotype collection included a wide range of plant height, color, and leaf texture (Photo 4). Statistical analysis of area under disease progress curve (AUDPC) revealed significant differences among genotypes for severity of brown patch symptoms (Table 1). Some ecotypes displayed resistance equal to or higher than proven standard cultivars. Broad sense heritability for brown patch resistance in the first year's collection and screening was 0.64.

## Conclusions

Because brown patch resistance in tall fescue is a heritable trait controlled by mostly additive gene action, ecotypes selected in this experiment should have value in a resistance breeding program. Ecotype collection has continued in 2014. The top ten performers for resistance in this experiment have been included in a polycross for progeny evaluation. These plants have been selected for survivability and not turf quality. Much breeding and selection will be required if these ecotypes are to lead to a high-quality turf cultivar.

## Literature Cited

- Bokmeyer, Jonathan M., Stacy A. Bonos, and William A. Meyer. 2009. Inheritance characteristics of brown patch resistance in tall fescue. *Crop Sci.* 49:2302–2308.
- Tomaso-Peterson, M., and L. E. Trevathan. 2007. Characterization of *Rhizoctonia*-like fungi isolated from agronomic crops and turfgrasses in Mississippi. *Plant Dis.* 91:260-265.
- Watkins, Eric, Stacy A. Bonos, and William A. Meyer. 2009. Heritability of brown patch resistance in tall fescue. *Int. Turfgrass Soc. Res. J.* 11:271-281.