

## Characterization of Pathogenicity and Fungicide Sensitivity of *Gaeumannomyces graminis* var. *graminis* Causing Bermudagrass Decline in Golf Course Turf

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### Research Summary

There is a lack of epidemiological information of *Gaeumannomyces graminis* var. *graminis* (Ggg) causing a devastating root disease of bermudagrass in golf courses (Fig. 1) and take-all root rot in residential turf (Fig. 2). Consequently, cultural and chemical control practices are not well studied for bermudagrass decline. Systemic and site-specific fungicides labeled for turfgrass applications have proven effective for many fungal diseases. However, their field efficacy data for Ggg are limited and no long-term control of bermudagrass decline has been achieved by these fungicides. Characterization of Ggg populations is critical for improving our current bermudagrass decline management in golf courses. Knowing fungicide sensitivities of Ggg populations can provide rapid and reliable data to suggest if acceptable control of bermudagrass decline can be achieved by given fungicides. First, we performed fungicide sensitivity assays (Fig. 3) of Ggg isolates collected from Texas turfgrass-growing regions where previous usage of the fungicides has been limited. We determined baseline sensitivities ( $EC_{50}$  = the effective concentration of a particular fungicide that inhibits mycelial growth by 50%) to three major chemical classes: benzimidazole fungicide thiophanate-methyl ( $< 500 \mu\text{g a.i. ml}^{-1}$ ), demethylation inhibitor fungicide tebuconazole ( $\leq 0.3 \mu\text{g a.i. ml}^{-1}$ ), and quinone outside inhibitor fungicide azoxystrobin ( $\leq 0.4 \mu\text{g a.i. ml}^{-1}$ ). We also determined variation of pathogenicity within our Ggg isolate collection. Since innate difficulty to produce signs or symptoms of Ggg on turfgrass by artificial inoculation, we use rice plants instead because both turfgrass and rice provide susceptible hosts for Ggg (Fig. 4). Certain isolates were much aggressive and virulent causing significantly stunted shoot and root growth of rice seedlings (Fig. 5). Golf course superintendents can design a proper fungicide program based on fungicide sensitivity data, which will save money on costly fungicides that otherwise would be ineffective in the event of infection by resistant Ggg. Our pathogenicity assays will also be helpful to decision making processes of turfgrass managers, which will allow them to respond differently to bermudagrass decline based on virulence of causal Ggg isolates.

- Baseline fungicide sensitivities of *Gaeumannomyces graminis* var. *graminis* (Ggg) to three major fungicides were determined
- Ggg pathogenicity assay can be performed in rice plants
- A wide variability in the infection aggressiveness was found in Ggg isolates



Fig. 1. Bermudagrass decline in a Texas golf course



Fig. 2. Take-all root rot caused by *Gaeumannomyces graminis* var. *graminis* in St. Augustinegrass

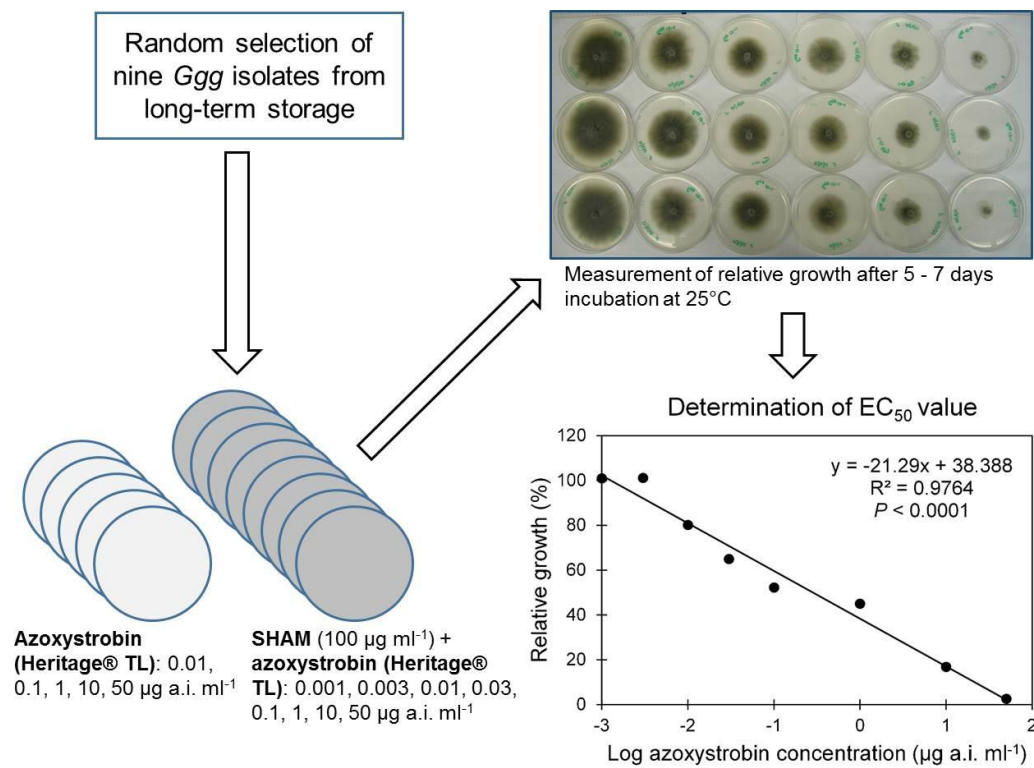


Fig. 3. Procedure of fungicide sensitivity assay

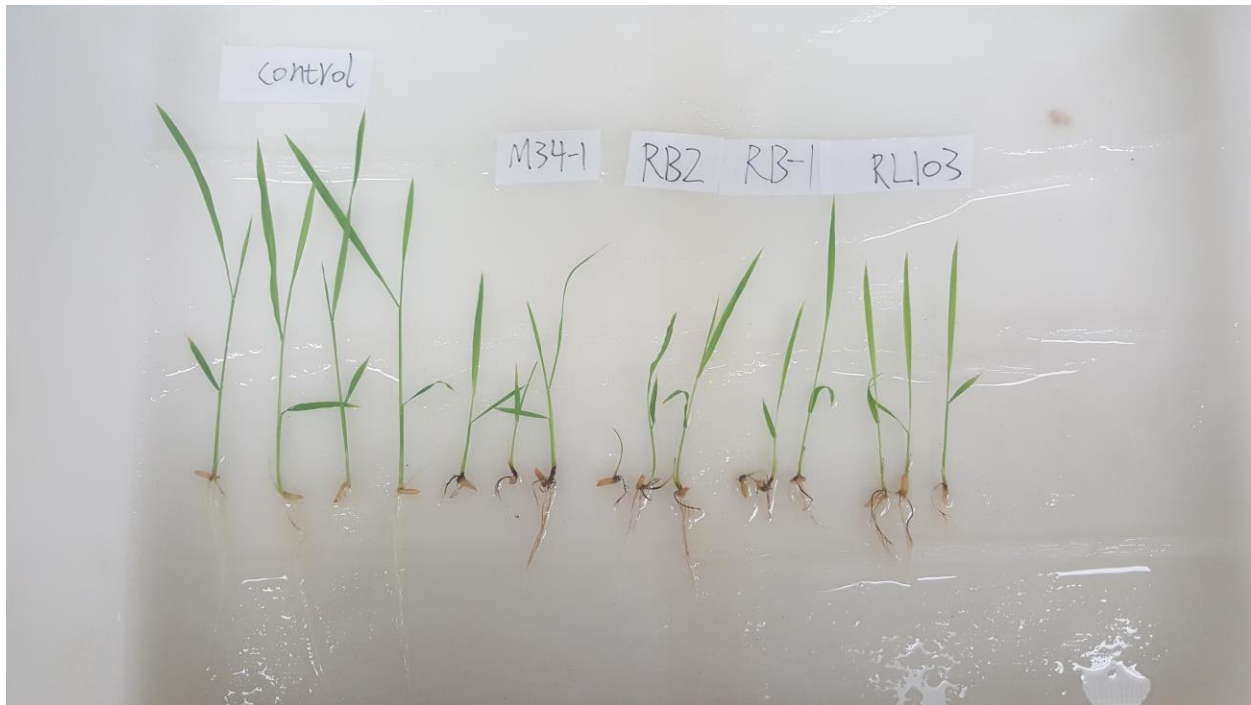


Fig. 4. Infection of *Gaeumannomyces graminis* var. *graminis* isolates in rice seedlings

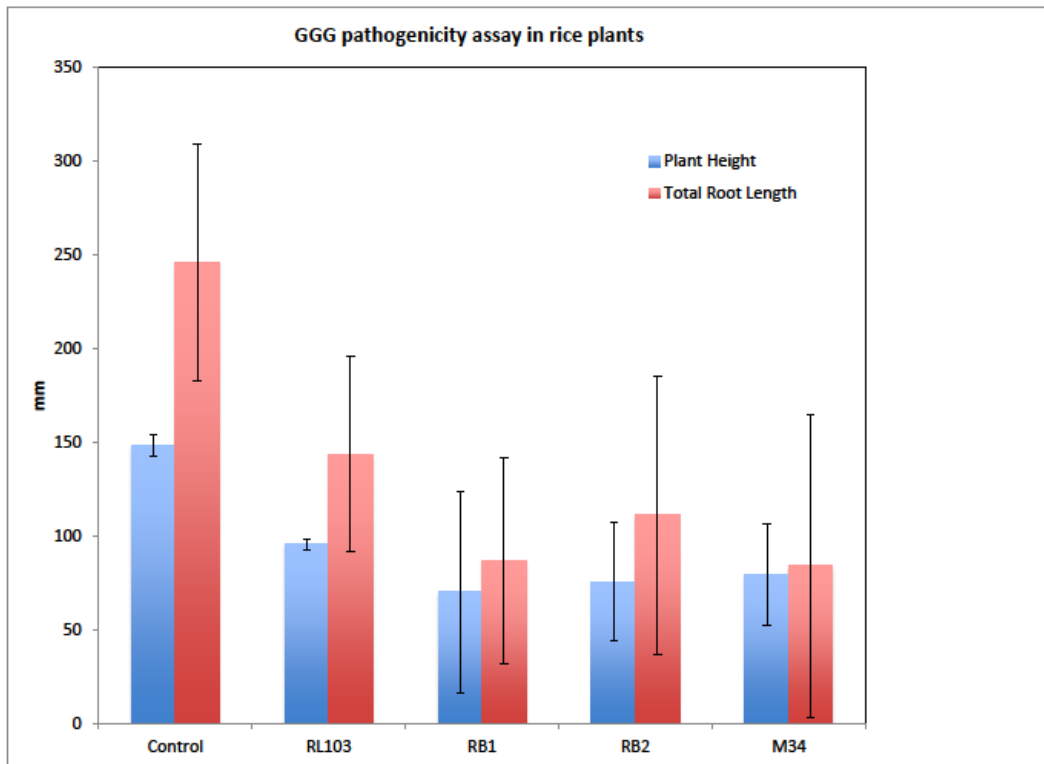


Fig. 5. Reduced growth of rice roots and shoots by *Gaeumannomyces graminis* var. *graminis* isolates