Infection and colonization of bermudagrass by Ophiosphaerella species: the causal agents of spring dead spot of bermudagrass

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Objectives:

1. *To transform O. korrae to express green (GFP) and red (tdTom) fluorescent proteins.*
2. *Compare and contrast infection and colonization of roots and stolons/rhizomes of resistant and susceptible interspecific hybrid, common, and African bermudagrasses by O. herpotricha and O. korrae that express fluorescent proteins.*

Bermudagrasses in the transition region will undergo cool–temperature induced dormancy during winter months. In this region, spring dead spot (SDS) is the most devastating and important disease of bermudagrass (Figure 1). The disease is caused by any one of three fungal species in the genus Ophiosphaerella (*O. herpotricha, O. korrae, or O. narmari*). The disease results in unsightly dead patches in the spring on bermudagrass fairways, tees, and greens and the patches can persist for months. A limitation to the study of turfgrass diseases that occur on roots, stolons, and crowns in the soil, such as spring dead spot, is the inability of researchers to rapidly and easily study the plant–fungus disease interaction. Here we are using transformed *O. korrae* that express fluorescent protein genes, which aids in our ability to study this disease. The overall goal of this project is to enhance our understanding of the interaction between Ophiosphaerella species and different bermudagrass hosts and to reduce the impact of this disease to bermudagrass in the transition zone.

Hybrid turf–type bermudagrass (*Cynodon dactylon* × *C. transvaalensis*) cultivars Tifway (susceptible to SDS) and Midlawn (tolerant to SDS), and two African bermudagrass (*C. traansvalensis*) cultivars Uganda and 3200, both believed to be tolerant of SDS, were evaluated for fungal colonization and necrosis (death) of root and stolon tissues over time. *Ophiosphaerella korrae* colonized roots of all cultivars at a similar rate with necrosis evident as early as 2 days after inoculation on Tifway and Midlawn, while on 3200 and Uganda necrosis appeared at 8 days and was less severe (Figure 2). For Midlawn and Tifway stolons, necrotic areas were evident four days after inoculation in contrast for 3200 and Uganda stolons showed discoloration and no necrosis up to 22 days when the studies were terminated.

Similar studies were conducted previously with *O. herpotricha* and infection and colonization of the various bermudagrasses by the two fungi were

Figure 1. Spring dead spot patches on bermudagrass.

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Figure 2. Tifway root (left) exhibiting extensive necrosis 14 days after inoculation (top) and mycelium of *O. korrae* expressing the red fluorescent protein gene, tdTomato (bottom) and 3200 root (right) exhibiting little necrosis 14 days after inoculation (top) and mycelium of *O. korrae* (bottom).

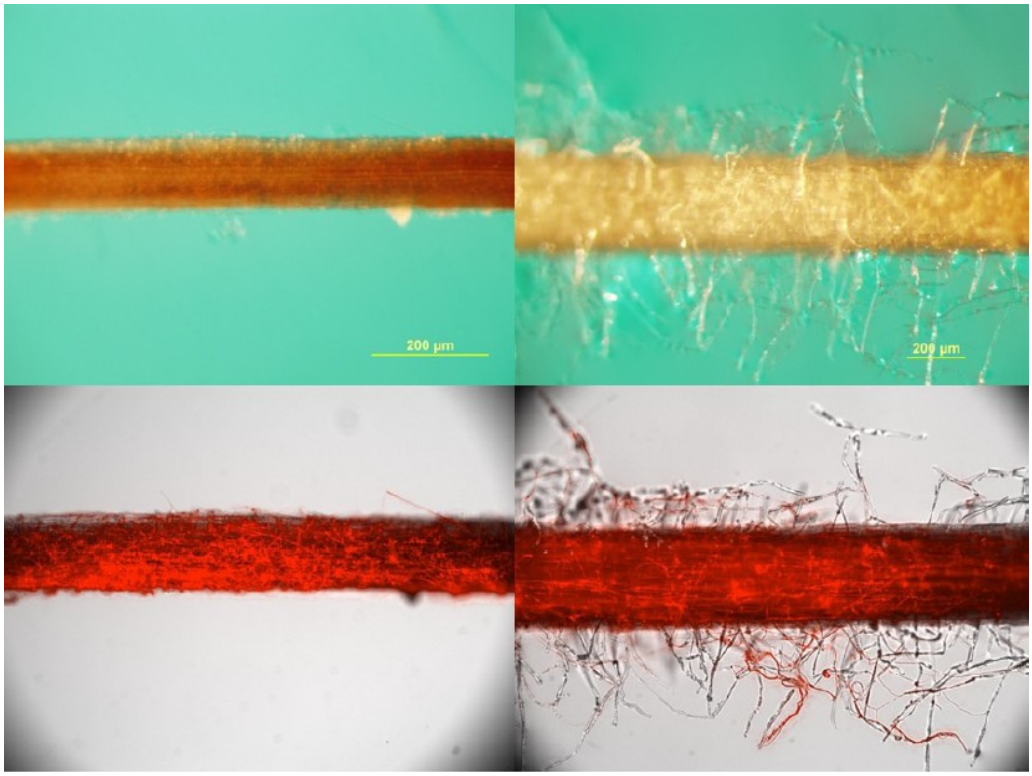
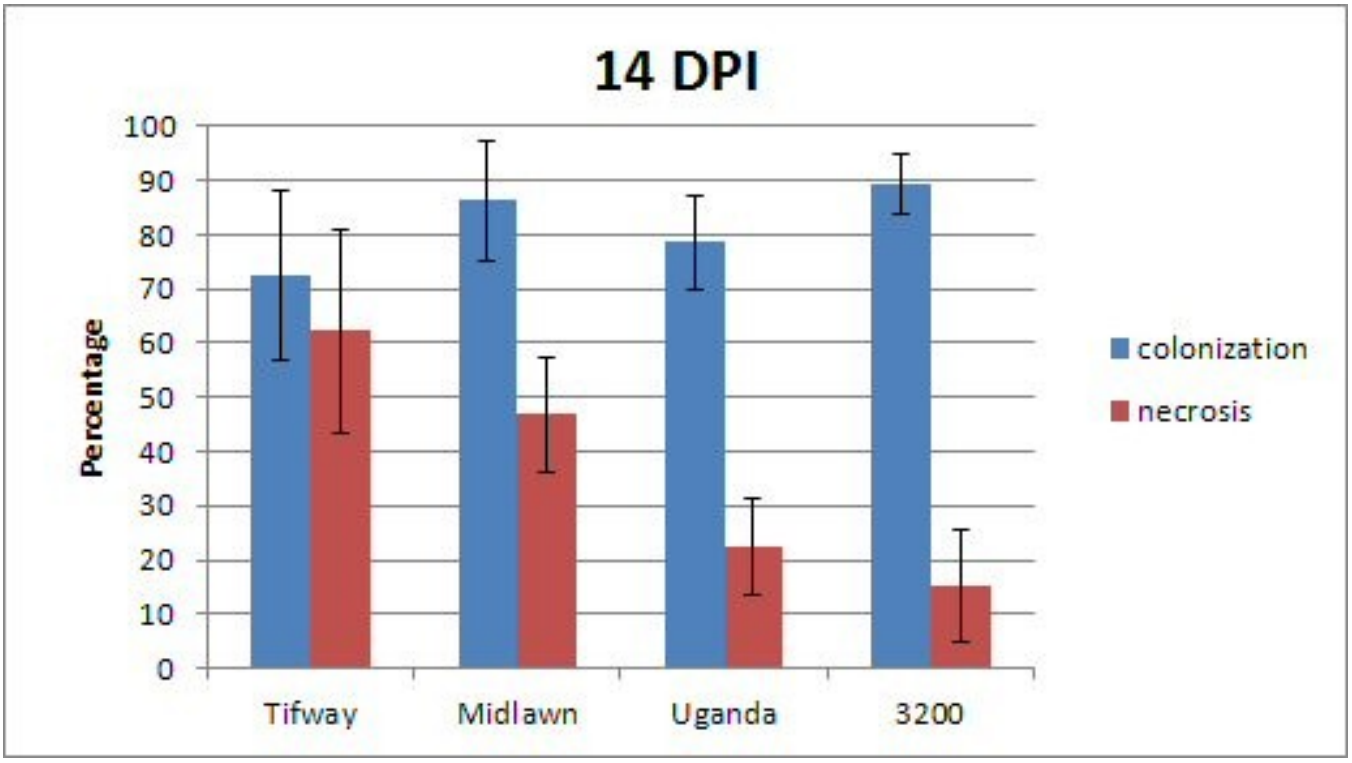


Figure 3. Quantification of colonization and necrosis caused by *O. korrae* on bermudagrass roots at 14 days post inoculation using digital analysis software.



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compared. Generally, no significant differences were observed for root colonization between the two fungal species. Similar to what was observed with *O. herpotricha*, vascular colonization of Uganda and 3200 occurred on older roots suggesting both fungi are capable of colonizing the stele of these *C. traansvalensis* accessions. Release of reactive oxygen by the plants, a recognition response to fungal colonization, was investigated, but no significant trends have been observed to date. This basic information on how the cultivars react to the fungus will improve our ability to enhance and deploy host plant resistance through traditional breeding efforts at Oklahoma State University.

Summary Points

- Transformants of *O. korrae* were generated and used to study infection and colonization of tissues of bermudagrass varieties differing in susceptibility.
- Notable differences in the rate and extent of plant cell colonization and necrosis by the fungus were observed, indicating a differential response among grasses to the fungus.
- This information will be used to enhance host plant resistance through traditional breeding efforts at Oklahoma State University.

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