

FINAL REPORT (April, 2011)

OTRF TURFGRASS RESEARCH FOUNDATION PROJECT, 2008-2011

PROJECT TITLE: Rhizoctonia diseases of turfgrasses

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SUMMARY:

A three year study on Rhizoctonia diseases of turfgrasses funded by the Ontario Turfgrass Research Foundation was carried out at the University of Guelph. The fungal genus *Rhizoctonia* causes a variety of diseases on turfgrasses. The best known member, *Rhizoctonia solani*, causes brown patch of a variety of grasses. Two other species are known to occur on turfgrasses in Ontario: *Rhizoctonia cerealis* (the cause of the yellow patch), and *Rhizoctonia zaeae* (the cause of the more recently discovered brown ring patch) first found in Ontario by Hsiang and Masilamany (2007). This last fungus is actually a complex of species, which includes *R. zaeae*, *R. oryzae*, and *R. circinata*. These are the names for the vegetative state of the fungus, and the full name of the sexually reproductive state is *Waitea circinata*, hence one of the names for the disease: "Waitea Patch". In addition to confusion and controversy over both the scientific name of the fungus and common name of the disease, there are still many aspects of the biology and control of this organism which are not clear. This need for a proper name for the fungus has become more urgent in recent years with increasing frequency of reports of brown ring patch across the United States from California to Connecticut (Wong and Kaminski 2007).

The objectives of this work were to examine isolates of *Rhizoctonia* for their ability to cause disease on a range of turfgrass host species, to examine the sensitivity of the fungi to a variety of fungicides, and to investigate the extent of genetic differences between the different fungi. The results are reported below.

Host range

There are three subspecies of *Waitea circinata* called Wcc (var. *circinata*), Wco (var. *oryzae*) and Wcz (var. *zaeae*). Hsiang & Masilamany originally reported Wcz (*Rhizoctonia zaeae*) in Ontario in 2007, but since then we have determined that this is actually a Wcc. In lab inoculation tests on different plant hosts, we found that all three subspecies of *Waitea circinata* (Wcc, Wco and Wcz) coming from different locations around the world, can show pathogenicity to a variety of host plant species, including: *Oryza sativa* (rice), *Triticum aestivum* (wheat), *Poa annua* (annual bluegrass), *Poa pratensis* (Kentucky bluegrass), and *Agrostis stolonifera* (creeping bentgrass). A smaller experiment with different creeping bentgrass varieties has also found some differences between resistance, but this study would need to be enlarged and done in the field for the results to be released. In 2010, we reported the first discovery of Wcc in British Columbia from a mixed annual bluegrass/creeping bentgrass putting green. Isolate Wcy coming from Florida, was found to be non-pathogenic to creeping bentgrass, Kentucky bluegrass and tall fescue.

Fungicide sensitivity

In 2009, we learned that Dr. Frank Wong at University of California Riverside is doing

extensive field trials for chemical management of brown ring patch, so we decided not to repeat his tests. Instead, we concentrated on Ontario isolates of Wcc, and examined the in vitro sensitivity of 19 isolates of Wcc to several fungicides. We found that isolates from Ontario show high sensitivity to Banner and Triton with moderate sensitivity to Daconil, but very little sensitivity to Senator. This is in line with our recommendations for Brown Ring Patch control which does not include fungicides from the benzimidazole group (including Senator) since these types of fungicides have been found to be ineffective for brown ring patch, and its close relative yellow patch (caused by *Rhizoctonia cerealis*). In general, DMI fungicides such as propiconazole (in Banner) and myclobutanil (in Eagle) and dicarboximide fungicides such as iprodione (in Rovral) show good control of brown ring patch, but the strongest control is by strobilurin fungicides such as azoxytrifloxystrobin (in Heritage) according to Dr. Bruce Martin who has worked very extensively with *Rhizoctonia* diseases.

Growth conditions

The optimal growth temperature for isolates of Wcc from turfgrass is between 25 C and 30 C. However, these isolates also growth well (>60% full growth rate) at 15 C. Other subspecies, Wcz and Wco have higher growth temperature optima.

Genetic variation

A total of 74 isolates from around the world and Canada were collected for this project. We gathered isolates from locations such as Japan where the disease was originally described, from different sites in both east and the west coasts of the U.S., from Portugal, Australia, and China. Isolates from Canada have been also collected from four locations in ON and one from BC. Isolates have been characterized by genetic sequencing of the ribosomal rDNA region to determine the species and subspecies. Other gene regions such as elongation factor 1-alpha, RNA polymerase, beta-tubulin, rDNA intergenic spacer, and rDNA 28S gene have also been examined for genetic variation, and the results are similar to what has been found with the rDNA internal transcribed spacer region. Isolates of Wcc have been found mostly on annual bluegrass across North America, with reports on creeping bentgrass from Canada and Japan. None of the isolates obtained from turfgrasses in Canada has been found to be Wcz or Wco. In Ontario, we also have been able to isolate Wcc from annual bluegrass/creeping bentgrass locations that have never shown the symptoms associated with Waitea patch. With increasing summer temperatures, the pathogen *Waitea circinata* var. *circinata*, and the disease it causes, brown ring patch, will likely increase in frequency in the future.

PRESENTATIONS & PUBLICATIONS FROM THIS STUDY

Hsiang T. 2010. Brown ring patch (also known as Waitea patch) on turf in British Columbia. Turfline News 220:40-43.

de la Cerda K and Hsiang T. 2010. Waitea circinata and its Rhizoctonia relatives. Ontario Turfgrass Symposium. Guelph, Ontario, February 15-16, 2010. (Invited Speaker, Industry)

de la Cerda K, Hsiang T, Joshi V. 2010. *Waitea circinata* from turfgrass in British Columbia. Plant Disease 94:277.

de la Cerda K and Hsiang T. Phylogenetic, morphological and pathogenic analyses of *Waitea circinata* and its *Rhizoctonia* anamorphs. Canadian Phytopathological Society Annual Meeting, Winnipeg, Manitoba, June 22-25, 2009. Can. J. Phytopath. 31:480 (Research).

de la Cerda K and Hsiang T. 2009. Waitea patch: biology and control. Ontario Turfgrass Symposium. Guelph, Ontario, February 19-20, 2009. (Invited Speaker, Industry)