Have Less Snow Mold This Year? We're Trying to Find Out Why.

By Elizabeth Scheef and Dr. Geunhwa Jung, *Department of Plant Pathology, University of Wisconsin–Madison*

Over the next few months, we will be introducing the scientists working in Dr. Geunhwa Jung's lab, and explaining their turfgrass related projects. This month begins with Elizabeth Scheef.

"I began my curiosity in science at a young age and have been lucky enough to turn it into a career. Originally from Racine, Wisconsin, I moved to Madison almost six years ago to begin work on my Bachelors of Science degree in Genetics and Wildlife Ecology at UW-Madison. During that time I had the opportunity to do research in a pathology lab on campus working with cancer. Interested in what it would be like to work with plants, I joined Dr. Jung's lab almost two years ago as an undergraduate student worker. Since Dr. Jung's lab had just begun, I had excellent opportunities to put my research skills to the test and work on several projects. I enjoyed the work so much that last summer I began working towards my Masters of Science degree in plant pathology under Dr. Jung.

With a background in both genetics and wildlife ecology, I really wanted to combine the two in my research project by using genetics to impact environmental ecology. The organism that gave me the opportunity to do this was *Typhula* spp., more commonly known as the causal pathogen of gray or speckled snow mold.

Typhula spp. is a cold-loving fungus that grows in the microclimate under the snow and can cause extensive damage to turf. It commonly occurs on golf courses and turf areas in the Great Lakes region, Canada and the northwestern US. Each fall in Wisconsin, just before winter arrives, golf courses individually spend $12,000-$20,000 in fungicides to control snow mold. Unfortunately, due to limited research investigating *Typhula* spp., not much is known about its biology and how it is influenced by factors such as weather and fungicides. However, we do know that the genus *Typhula* is composed of three different species *T. incarnata*, *T. ishikariensis*, and *T. phacorrhiza*. These three species have morphological characteristics such as color, sclerotia size and rind pattern, color of infected patches of turf, and color and size of sporocarps that can be used to differentiate them. However, these characters can sometimes overlap or be indistinct, resulting in misidentification. Furthermore, the identification of three varieties of *T. ishikariensis* (*ishikariensis*, *canadensis*, and *idahoensis*) is more difficult using the morphological traits. We have also recognized that weather patterns, such as duration of snow cover, affect the severity of snow mold damage. For example, last year in Wisconsin when the winter was long and cold with deep snow cover, damage from *Typhula* snow molds seemed to be severe. This year however, after a very mild winter with frequent snow melts, many courses are not finding any symptoms of *Typhula* snow molds. These correlations with weather have been observed by many who work with turf, but have not been scientifically investigated.

Currently, the successful management of *Typhula* snow mold relies heavily on fungicide treatments. However, inconsistent protection by current fungicide treat-

ments and lack of accurate identification of the pathogen associated with snow mold symptoms have made management strategies difficult to employ. Furthermore, it is well known that some fungicides that are effective against gray snow mold caused by *T. incarnata* are ineffective against speckled snow mold caused by *T. ishikariensis*, and vice-versa. The same phenomenon also exists among three varieties of *T. ishikariensis*. In order to overcome these adversities, the best management strategy for the control of snow mold is to apply proper fungicides targeting *Typhula* species and varieties.

In order to accurately identify *Typhula* species collected from the field, our lab has designed a specific molecular DNA tool that indicates which species or variety of *Typhula* we have sampled. We have also recorded variation in sensitivity to fungicides among the *Typhula* species in the lab and under field conditions. Utilizing this information, we have initiated a program to investigate the distribution of *Typhula* species and varieties in Wisconsin and develop specific management strategies for each *Typhula* species and varieties.

Our research objectives for this project are:

1. Determine the distribution of *Typhula* species and varieties throughout the state of Wisconsin.
2. Determine the influence of factors such as temperature, snow cover, and species interactions on *Typhula* distribution.
3. Use the information gathered along with the knowledge of fungicide sensitivity to design an effective fungicide use plan that will reduce the types of fungicides and number of applications used for snow mold control.

So how do we accomplish these goals? Lots and lots of samples. A dedicated team of people traveled across Wisconsin last spring to visit 100 golf courses and collect over 2,000 samples of *Typhula* snow mold. We chose the golf courses to represent different temperature zones and snow cover duration zones found in Wisconsin. Then at each golf course, we randomly selected four fairways. Each fairway was sampled five times from green to tee. At each sampling location we collected turf infected with *Typhula* sclerotia (their asexual stage) and recorded coordinates using a geographical positioning system (GPS) unit, so we could later map out species distribution. We then brought the samples back to the lab. We isolated the pathogen, got them to grow, extracted their DNA, and used our molecular method to determine the species or variety.

So what have we found? This year was definitely a learning experience in culturing *Typhula* and extracting the DNA. So far we have determined the Typhula species of about 1,200 samples. We are already noticing some patterns in *Typhula* distribution in Wisconsin. For example, *T. incarnata* is an indiscriminate grower, and was found throughout the state, regardless of temperature, or duration of snow cover. *T. phacorrhiza* was also found across the state, but was very rare. *T. ishikariensis* varieties were found mainly in the northern half of Wisconsin. Interestingly, *T. ishikariensis* distribution tended to be north of the Tension Zone in Wisconsin, which divides the state between the northern forests and the southern oak savannah. This may be an indicator of the effects of climatic differences on *Typhula* species distribution. We found that the *T. ishikariensis* variety *idahoensis* was very rare, and was only found on golf courses that

also had varieties *ishikariensis* and *canadensis*. During our collection we also gathered information on fungicides used at each golf course and plan to determine if they play a role in *Typhula* distribution.

What will we do now? Repeat, analyze and analyze some more. Since last year was such a harsh winter and this year's winter was so mild, it's the perfect opportunity to see exactly how much effect weather really has on *Typhula*. This spring we're repeating our experiment to match the procedures we used in 2001. Much to the joy of golf course superintendents, fewer golf courses are affected by *Typhula* snow mold, which means visiting fewer golf courses and less total samples. Again we'll analyze the data to see the effects of temperature, snow cover duration, fungicides used and species interactions. Then we'll be able to compare the extreme differences from year to year and see how *Typhula* is affected. In the future, we're also planning to extend our collection into Minnesota and Michigan to determine if the correlation we found in Wisconsin holds true in neighboring states. We then plan to design a more effective management method to control *Typhula* snow mold by using fewer, targeted fungicide sprays. Not only will this reduce the environmental impact from fungicides, but it will also save the consumer money.

Researchers in the Department of Plant Pathology sincerely appreciate your voluntary cooperation for last year's snow mold sample collection and in advance for this year's."

Wisconsin Golf Course Superintendents Association 2002 Meeting and Education Schedule

May 29	The Super-Pro, Country Club of Wisconsin, Grafton WI • Host - **Gordon Waddington**, Golf Course Superintendent • Education - Pat Jones, Golfdom Magazine
June 11	The Golf Club at Camelot, Lomira, WI • Host - **Pat Zurawski**, Golf Course Superintendent
July 15	Wisconsin River Golf Club, Stevens Point, WI • Host - **Todd Blankenship**, Golf Course Superintendent
August 13	WTA Field Day - O.J. Noer Turfgrass Research Facility, Verona, WI
September 9	Fox Valley Golf Club, Kaukauna, WI • Host - **Scott Bushman**, Golf Course Superintendent • Education - Bob Vavrek, USGA, "Year in Review"
September 30	Pine Hills Golf Club, Sheboygan Country Club • Host - **Rod Johnson**, Golf Course Superintendent • Education - Ron Forse, Forse Design, "To Tree or Not to Tree"
October 4, 5	Quit-Qui-Oc Golf Club, Elkhart Lake, WI • Host - **Brian Feldman**, Golf Course Superintendent • Vender Host - Bill Vogel, Spring Valley Turf Products
October 10	WTA Fundraiser - Blackwolf Run (Valley-Meadows) • Host - **Mike Lee**, Golf Course Superintendent
November 12, 13	Wisconsin Golf Turf Symposium - The American Club, Kohler, WI • Topic - "Doing More With Less": Resource, Time and Money Management • Sponsor - Milorganite
December 10, 11	GCSAA Seminars, Ramada, Fond du Lac, WI