Wonders, Typhula's Basidiocarps and Snow Scald?

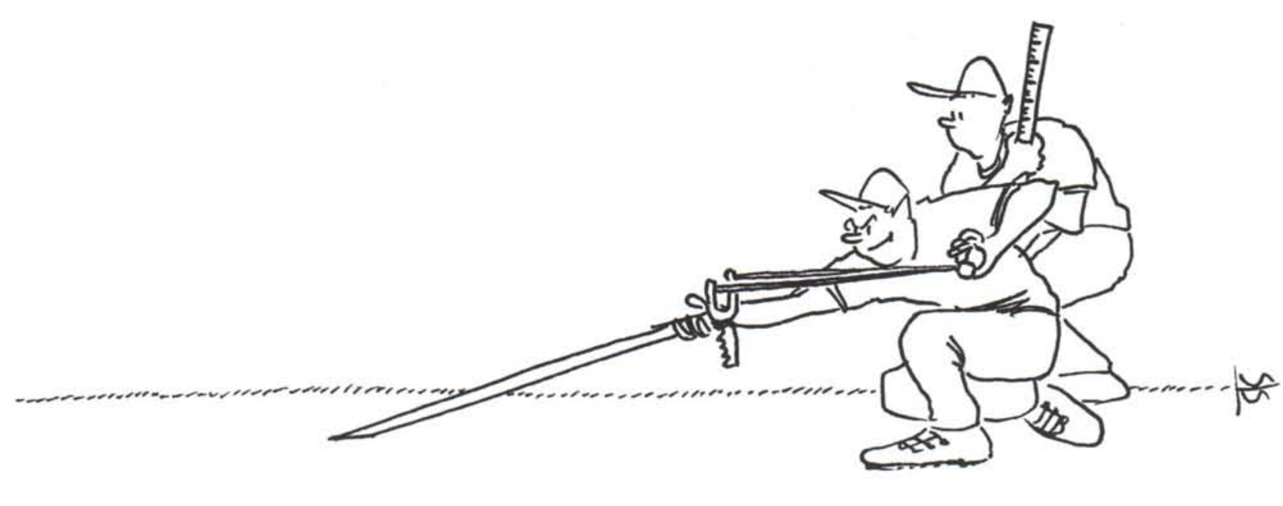
By Dr. Geunhwa Jung and Steve Abler, *Department of Plant Pathology, University of Wisconsin-Madison*

A few weeks ago, Wisconsin/Minnesota snow mold field days, the last of our 2005 activities of the Wisconsin turf pathology program, was very successfully completed. I would like to express my sincere thanks to Steve Abler, who put together all the work on a timely and professional way, and also extend my appreciation to superintendents who provided the research plots and helped with the events. Since we were all overwhelmingly saddened by winter kill of annual bluegrass, ryegrass, and tall fescue throughout Wisconsin, I couldn't talk about the snow mold damages. In fact, it was one of the best years for the snow molds, especially in northern regions for as long as I remember. Our untreated control plots had almost 100% snow mold damage at both sites, Gateway GC in Wisconsin and Giants Ridge GC in Minnesota.

Briefly, 2,895 individual plots were established at four locations in Wisconsin and Minnesota. Fungicide efficacy studies included 88 different fungicide combinations for snow mold. Additionally, studies funded by the GCSAA and WGCSA, which looked at the efficacy of individual labeled fungicides to control multiple isolates of six snow mold pathogens, were carried out at Stevens Point and Land O' Lakes, Wisconsin.

This year, we had the field days at three sites — Sentryworld GC, Stevens Point and Gateway GC, Land O' Lakes, Wisconsin and The legend at Giants Ridge, Biwabik, Minnesota. Approximately forty-five people (chemical reps, superintendents, and researchers) attended. Some came to one but some came along to all three. Thank you for your participation despite many hours of driving from site to site.

Nature is full of wonders which make scientists spend hundreds of hours to explore and research those wonders. I want to share with you two exciting experiences I had during this past winter. First, it is about basidiocarps (Figure 1A) in nature, a sexual structure of *Typhula* species and secondly is about snow scald caused by *Myriosclerotinia borealis*, one of the snow mold (cold-loving) fungi. *Typhula* species, *T. incarnata*, *T. ishikariensis*, and *T. phacorrhiza* are the most common pathogenic fungal species occurring in Wisconsin as far as I know. In disease cycle, *Typhula* pathogens infect turfgrasses from mycelia germinating either from sclerotia (over-summering structures) (Figure 1C) or from basidiospores produced on the



sporocarps (Figure 1A). Mycelia from germinating sclerotia might be the primary way of infecting the plants because we rarely see sporocarps in nature.

Finally, Steve was able to get a chance to see hundreds of the sporocarps of *T. incarnata* at the Gateway in early November 2004. I have been looking for sporocarps for many years and miserably failed to observe them (even with my attempts to inoculate many hundreds of sclerotia on my own lawn). After I saw the sporocarps brought by Steve, I was so excited that I couldn't resist telling people. I often wonder whether you have the same excitement as I do. Yet, I am still searching for more wonders like why this sexual reproduction portion of the *Typhula* life cycle is so rare in nature, especially in *T. ishikariensis*. In fact, we had worked out a way of producing the sporocarps regardless of *Typhula* species in controlled chamber in my lab. By the way, a million of individual basidiospores produced from the sporocarps (via recombination) are genetically different from each other. Sexual reproduction in most living organisms including fungi can be a most effective way of adapting into adverse environments such as repeated use of same fungicides, turfgrass species, environmental climates, and other stresses and managements. From them, insensitive or more virulent isolates or races can be selected.

The other wonder was to witness snow mold damages due to snow scald (or Sclerotinia snow mold), caused by *Myriosclerotinia borealis* (Bubák. & Vleugel) L.M. Kohn or *Sclerotinia borealis* Bubák & Vleugel, despite fungicide application on a golf course near by our testing site in Minnesota. Unlike the *Typhula* which is a basidiomycete, this pathogen is an ascomycete. As of today, I have not heard of its damage from other pathologists or seen it in Wisconsin despite extensive collections from 100 golf courses in Wisconsin. There are limited reports of this fungus published in North America, mainly from Alaska, Minnesota, Colorado, and Canada. The disease that we saw on the golf course was mostly on high slope areas of fairways and some on greens. This is not a surprise because this pathogen is reported to be most severe on turfs under long snow cover on frozen soils and less severe on water-saturated soils which are conducive for *Typhula* and *Michrodochium* snow molds.

The interesting thing is that the superintendent was successfully able to control *Typhula* and *Michrodochium* as his course, but was unable to control Myriosclerotinia using a combination of two fungicides. In our trials, the mixture did really well for *Typhula* blight and *Microdochium* patch. Water-soaking patches covered with grayish fungal mycelia and tan sclerotia appear as snow melts. Later the infected leaves become bleached to white and the relatively large sclerotia turned black. The optimum temperature for *M. borealis* development is -2°C. Oval or flake-like looking sclerotia

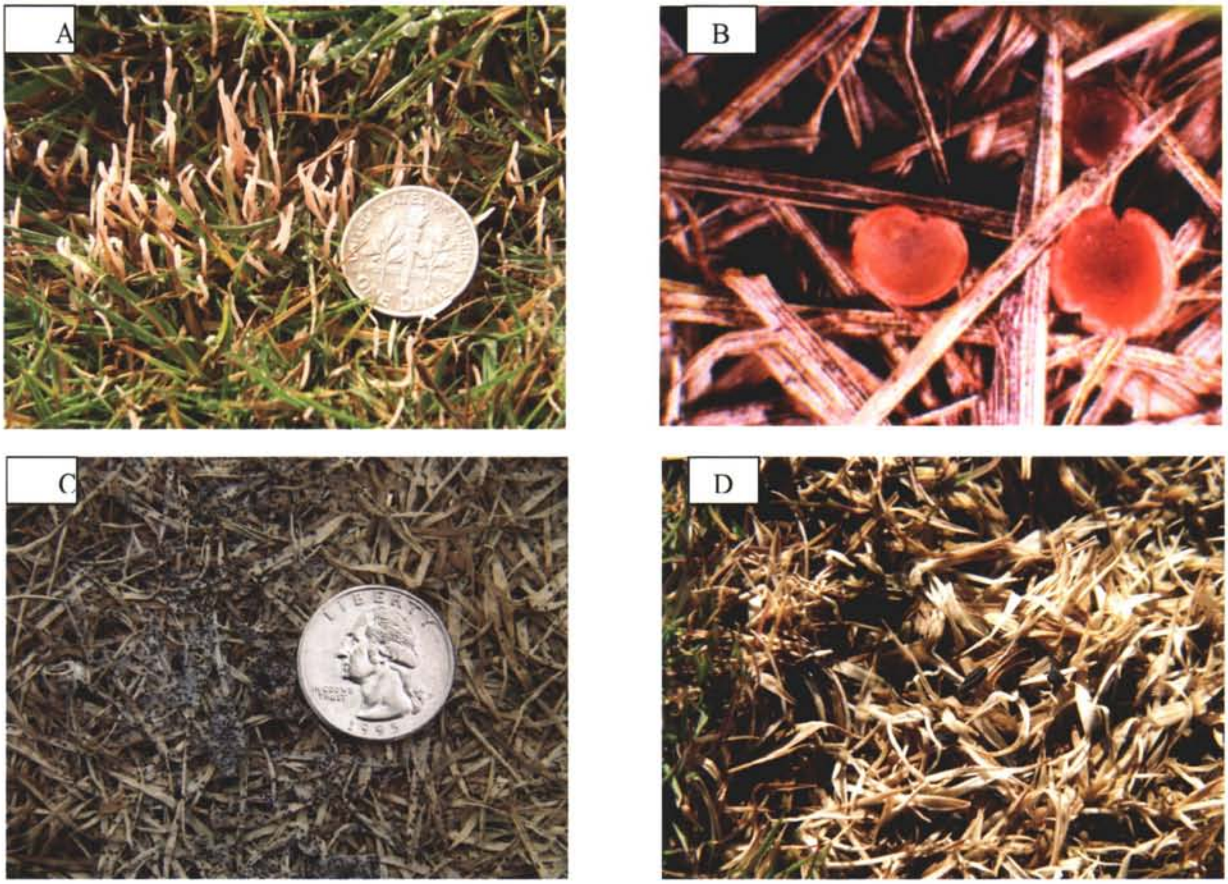


Figure 1. A) Fruiting bodies (sporocarps) of *Typhula incarnata* in creeping bentgrass golf fairway, B) Fruiting bodies (apothecia) of *Myriosclerotinia borealis* on grasses (Photo from Golf Course Management), C) Over-summering structure (sclerotia) of *Typhula ishikariensis*, and D) Over-summering structure (sclerotia) of *Myriosclerotinia borealis*.

of *M. borealis* are variable in size (0.5 to 7.0 mm length) (Figure 1D). They are found mostly on the surface of leaves, usually loosely attached and in plant sheaths. Under moist and cool conditions in late fall, fruiting bodies (apothecia) of *M. borealis* up to 5-6 mm in diameter and high are produced (Figure 1B).

The pathogen relies primarily on ascospores produced from apothecia for primary inoculum and also sclerotia for means of local inoculum. Snow scald is more severe in areas that are very acidic, low in phosphorus, or have been fertilized with water soluble nitrogen sources in the late fall. Chemical control using two preventive applications or mixtures of thiophanate-methyl, PCNB, or chlorothalonil before the first permanent snowfall is recommended (Tani, T. and Beard, J., 1997 and Couch, H., 1995). Since very few fungicide chemistries are labeled for snow scald control (probably due to the infrequency of the disease), we are planning to test many of the fungicides on the market for efficacy of snow scald control this coming winter.

Figure 2. Severe damage of snow scald on a creeping bentgrass golf fairway in Northern Minnesota. A combination of two fungicides was applied and had an excellent control over Microdochium patch and Typhula blight.

References cited

Tani Toshikazu and Beard James. 1997. Color atlas of turfgrass diseases.

Couch, H. 1995. Diseases of turfgrasses.