# Stability of Genetic Resistance to Snow Mold in Creeping Bentgrass

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## INTRODUCTION

Winter diseases of turfgrass, collectively referred to as snow molds, are a major problem on golf courses and other turf areas in Wisconsin and similar regions. Golf course greens, fairways, and tees are of primary concern because of their high dollar value. Creeping bentgrass (*Agrostis palustris*) is a highly desirable species for these types of turf, but most cultivars are highly susceptible to various snow mold pathogens.

Speckled snow mold is caused by *Typhula ishikariensis*, a fungal parasite. It is a facultative parasite, capable of surviving and growing on necrotic tissue, becoming particularly serious when susceptible hosts are compromised either through injury or stress. The pathogen is most active at temperatures ranging from 32 to 55°F and is favored by extended snow cover. Disease symptoms begin as small, round patches (2-4" in diameter) with a water-soaked appearance. As the pathogen grows, the turf foliage dies, leaving brown patches that coalesce into extensive areas of severely damaged turf. In Wisconsin, areas of golf courses that routinely receive severe snow mold damage will have a low population of perennial turf grasses and a high population of annual-type *Poa* that regenerates each spring from the seed bank in the soil.

Fungicides are traditionally used to inhibit snow mold fungi on golf greens and other high-value turf areas in Wisconsin. However, fungicides are expensive to apply, often have limited terms of efficacy, and may adversely affect the environment. In addition, some fungal pathogens have developed resistance to fungicides after years of repeated applications.

In 1998, we initiated a breeding program to identify genetic resistance to speckled snow mold in creeping bentgrass. This paper reports the initial results of our collection expeditions and snow mold screening experiments.

## MATERIALS AND METHODS

In 1998 and 1999, we collected over 700 clones of creeping bentgrass from older (25+ years) golf courses throughout Wisconsin. Creeping bentgrass varieties contain large amounts of genetic variability. Therefore, older golf courses have the potential to weed out unadapted and/or unfit plants, simply through natural selection pressure over many years in the presense of stresses such as snow mold disease. In our search for genetic resistance to snow mold, we targetted Wisconsin golf courses with three criteria: north of U.S. Hwy 10, fairways are not treated with fungicides to control snow mold fungi, and significant snow mold damage occurs following a typical winter. We sampled plants that had a large diameter, green color, and absense of snow mold patches within 2

weeks of the final snow melt. We also collected plants from golf course greens in both northern and southern Wisconsin, with selection based on large diameter, bright green color, fine leaf texture, and absense of *Poa* within the bentgrass patch.

We screened 326 of these clones for reaction to an isolate of *T. ishikariensis* during the summer of 1999. The clones were split into six pieces, grown in 1.25 x 1.25 x 2" containers, and managed to simulate a fairway with a 1/2" mowing height. The clones were arranged in a randomized complete block design with six replicates. Flats were placed in a growth chamber to simulate the fall hardening period, with a gradual temperature reduction to 41°F and short daylength. Four of the six replicates were inoculated with *T. ishikariensis* and all plants were kept in the dark for 8 weeks. Disease reaction was scored weekly for 6 weeks using a 0-to-10 scale, where 0 = completely green plant and 10 = completely dead plant. Plants were then placed in a greenhouse where they were scored two more times, using the same rating scale. These clones were screened again during spring and summer 2000, but challenged by two isolates of *T. ishikariensis* and one isolate of *T incarnata*.

## RESULTS AND DISCUSSION

In general, there was a positive association between reactions to the three isolates of *Typhula*. However, some clones that were originally thought to be resistant were susceptible during the second experiment. Five clones were found to be highly resistant to all three isolates (Table 1). These clones will be intercrossed in summer 2001 to produce the first generation of a new variety. This variety will be tested on golf courses to determine its ability to resist snow mold under a wide range of real-world conditions.

Table 1. Reaction of creeping bentgrass clones to three isolates of Typhula.

| | *T. incarnata* isolate #1.41 | | *T. ishikariensis* isolate #3.116 | | *T. ishikariensis* isolate #1.83 | |
|---|---|---|---|---|---|---|
| Bentgrass clones | Disease reaction | Recovery reaction | Disease reaction | Recovery reaction | Disease reaction | Recovery reaction |
| Best five clones | 0.99 | 0.45 | 2.65 | 3.17 | 1.93 | 1.31 |
| All other clones | 2.55 | 2.65 | 3.84 | 5.24 | 3.06 | 3.22 |

Disease was measured after 6 weeks in cold, dark conditions.
Recovery was measured after 2 weeks in the greenhouse, simulating spring conditions.