An Introduction to Moss Control in Wisconsin

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My name is Paul Koch, and I am a new graduate student at the University of Wisconsin-Madison. I will be researching under Dr. Geunhwa Jung in the Plant Pathology Department, as well as assisting Steve Abler in the Turf Diagnostic Lab. My main background lies in golf course management, as I have learned the ropes working on two different golf courses over the past six years. Through my own experience, as well as reading the literature and talking to superintendents, I believe one of the most pressing problems in turf management today is the invasion of moss into intensively managed golf course putting greens. As increased golfer demand for faster green speeds has resulted in unprecedented stresses on turf, infestations of moss into golf course putting greens has become a major problem. Though pinpointing one exact reason for increasing moss encroachment is impractical, three of the most important cultural reasons for the rise are lower mowing heights, reduced nitrogen fertility, and discontinued use of mercury-based fungicides (4).

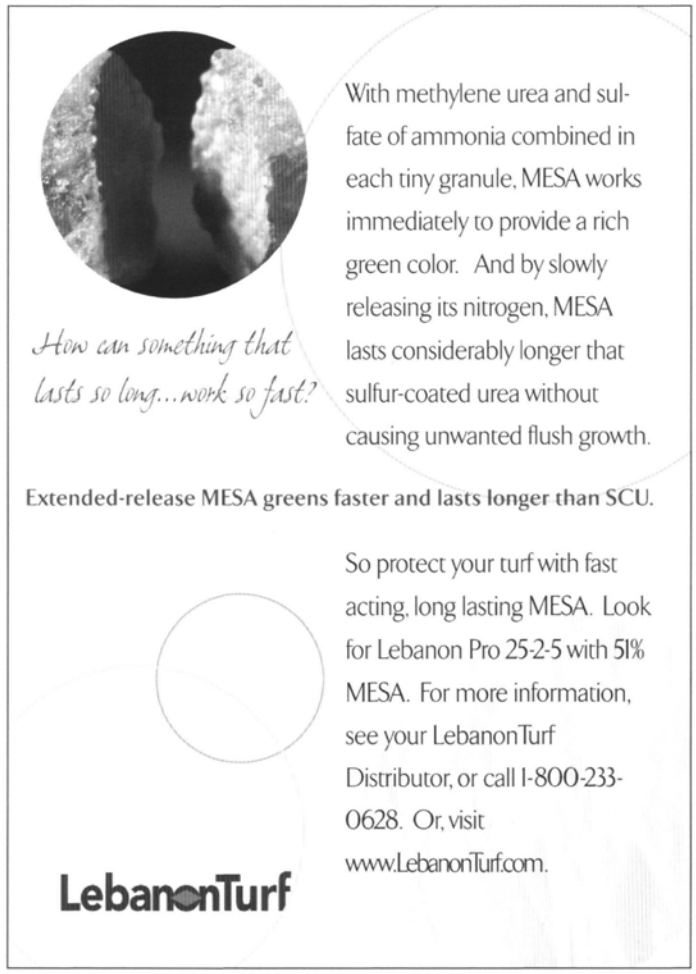
Moss Biology

When looking at the diversity of mosses, it is overwhelming to know that over 9500 species of moss exist (3). But only four of those species have been documented on golf courses in the United States, with silvery-thread moss *(Bryum argenteum)* undoubtedly the most common species found on golf course putting greens (1).

The biology of mosses is fairly simple compared to other plants such as grasses and trees. But it is this simplicity that has helped them survive in harsh environments for millions of years, and is what makes them so hard to control today. The most noticeable biological difference of mosses is that they have no vascular system (xylem and phloem). While this does not allow for mosses to grow more than a few centimeters tall, it also means that moss does not translocate any systemic pesticides throughout the plant that are applied to kill it!

Mosses also do not have true roots, stems, flowers, seeds, or fruit but instead are anchored by small hair-like filaments called rhizoids. These rhizoids absorb water and nutrients, and allow the moss to quickly establish itself on surfaces such as rocks, tree bark, and golf course putting greens.

Though moss has historically been perceived as growing only in very wet and shaded locations, silvery-thread moss has proven to be very adaptable to dry, sunny areas where thinning turf allows an opportunity for the moss to germinate. Contributing factors to thinning turf may be low cutting height, low fertility, poorly drained soils, excessively wet soils, compacted soils, excessive thatch, or some combination of the above. Where the turf does thin, moss spores in the environment can germinate and quickly establish within the turf surface. Once established, the moss can spread sexually by producing spores that are carried by wind, water, golfers, or mowing equipment. More often, though, moss is spread asexually. Mowers and other machinery such as core aerators spread



pieces of the moss plant around that can quickly establish itself in another area of the golf course. With the amount of foot and machine traffic that occurs every single day on a golf course, it is easy to see how quickly an isolated spot of moss can spread to every green on the course.

Current Control Options

There has been considerable research done in other parts of the country on different chemical controls for moss. Yelverton (2005) had success controlling moss in North Carolina using several different iron fertilizers and different Daconil formulations. Cook et al. (2002) had successful control in Oregon using Kocide 2000 (copper hydroxide), a soap product called No-Mas, and especially Junction. Landschoot et al. (2004) at Penn State also found Junction to be successful in controlling moss, and identified a rate of 4 oz/1000 sq. ft. to be optimal in cool weather.

What is interesting about the research is that what may work in one study had very little control in another. Yelverton (2005) had good moss control using Daconil in North Carolina, while Cook et al. (2002) had little to no control using it in Oregon. Cook et al. had success using No-Mas, but when tested in more arid California climates the product was said to be ineffective. Landschoot et al. found that Junction was an ineffective moss control during the humid Pennsylvania summers, but had better control once the temperatures cooled down in late fall.

What all this variability suggests is that climate plays a significant factor in not only what moss control products you can use, but also how effective they will be and the proper timing of those applications. What controls moss in North Carolina doesn't appear to work in Oregon or Pennsylvania. The question remains then; what products successfully control moss in Wisconsin?

Wisconsin Moss Control

Our research this summer at the University of Wisconsin-Madison will focus on the efficacy of moss control products in Wisconsin's unique climate. Some treatments successful in other climates will be tested, as well as some newer moss control programs that have been developed in recent years. Treatments will include a Daconil/Spotrete/Fore combination, Junction, Quicksilver, Dawn Ultra, and an experimental treatment. Many of these treatments are not labeled for moss control, but we are testing them in the hope of pushing for a moss label in the future for any successful products. The study will be conducted at the O.J. Noer Turfgrass Research Facility on a Penncross creeping bentgrass green mowed at 1/8 of an inch that has recently become infested with moss.

Preliminary results will be available to those attending the Wisconsin Turfgrass Association's Field Day at the O.J. Noer Turfgrass Research and Education Facility on July 26th. Please feel free to email me at plk@plantpath.wisc.edu if you have any questions regarding moss control or our research.

References:

1) Cook, Tom, Brian McDonald, and Kathy Merrifield. "Controlling moss in putting greens" *Golf Course Management*. Sept 2002 p. 103-106.
2) Landschoot, Peter, Joshua Cook, and Bradley Park. "Moss control- new products and strategies". *USGA Green Section Record* July/August 2004 p. 7-9.
3) Raven, Peter; Ray Evert, and Susan Eichhorn. *Biology of Plants*. 1992 p. 308-313.
4) Yelverton, Fred. "Managing Silvery-Thread Moss in Creeping Bentgrass Greens" *Golf Course Management*. March 2005 p. 103-107.

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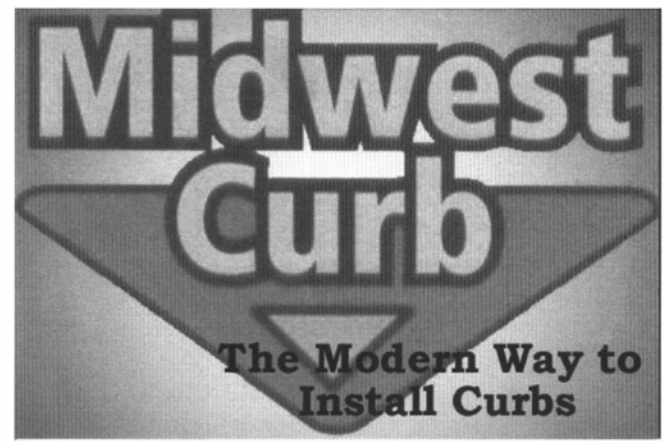

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