Effects of irrigation and fertilizer application method on the encroachment of silvery-thread moss into creeping bentgrass

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Introduction

The past 10 years have seen a marked increase of Silvery-thread moss (*Bryum argenteum* Hedw.) encroachment on cool season turfed golf greens on a variety of rootzone materials. Silvery-thread moss (STM) invasion compromises a healthy, dense turfgrass, leading to an inconsistency of ball roll and rebound resilience (Figure 1). Few approved chemicals are available for silvery thread moss control leading to limited success in the control of such infestations on Canadian golf courses.

This study examined the cultural practices of irrigation, and foliar fertilization on the establishment of Silvery-thread moss within a creeping bentgrass (*Agrostis stolonifera* L.) canopy.

Figure 1. Moss infestation into a turfgrass golf green (Photo courtesy of Pam Charbonneau)

Objectives

- To determine the effects of irrigation frequency and rate on the establishment of Silvery-thread moss in creeping bentgrass.
- To determine the effects of foliar, soil applied liquid and granular fertilizer on the establishment of Silvery-thread moss in creeping bentgrass.

Methods

Greenhouse experiments were conducted using creeping bentgrass in 8 cm diameter lysimeter pots that were constructed from a medium/coarse sand rootzone

Preparation of moss inoculum:
Moss was collected with a small spade and placed in large paper bags to dry at room temperature. After 2 weeks, sand was removed from dry STM and ground into a powder using a coffee grinder. Pots for both experiments were inoculated with 1g of moss per pot.

Irrigation Experiment:
For the irrigation experiment inoculation was followed immediately by the initiation of an irrigation program consisting of two rates, 75% and 100% of daily pan evaporation at cumulative frequencies of 1, 2, 4 and 7 days.

Fertilizer experiment:
For the fertilizer application method the moss was allowed to establish for 30 days before the fertilizer treatments were initiated. An 18-3-18 urea based fertilizer solution was prepared for the greenhouse experiment using urea, mono potassium phosphate and potash. The fertilizer was applied at a rate of 3.79L/100m^2 (~ 1gal/1000sqft) at a concentration of 45.35g (N)/L resulting in a rate of 0.5gN/m^2 (~ 1/10 lbs (N)/1000sqft) every 10 days, which was applied using three different methods. Granular applied fertilizer was applied evenly over the surface of the tube followed by an application of 50ml of deionized water. Soil applied liquid fertilizer was applied as approximately a 0.2ml spray followed by an application of 50ml of deionized water. Foliar applied fertilizer was applied by the addition of 50ml of deionized water followed by 0.2ml fertilizer spray. Granular was applied first, followed by soil applied, the pots were all watered with deionized water and then foliar fertilizer was applied. Soil applied liquids were on the leaves for a maximum of 5 minutes before water was applied. These procedures insure that minimal soil applied fertilizer was taken up by the leaves.

Results

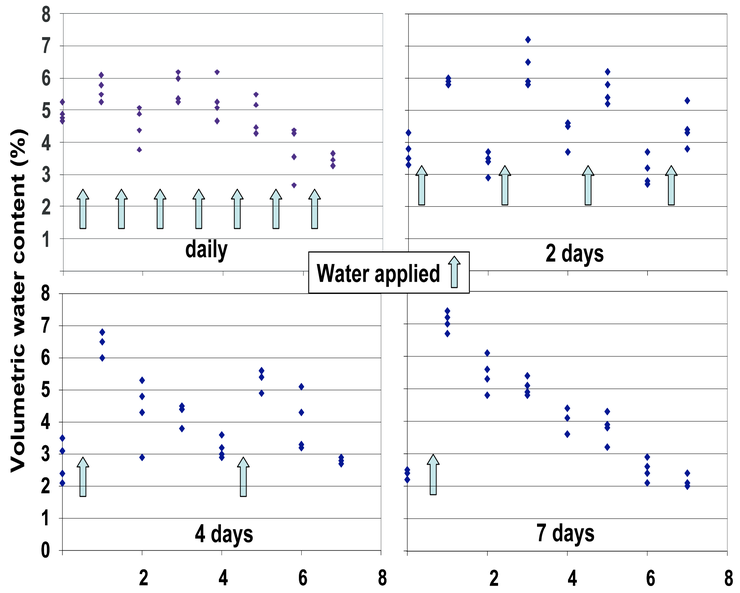

Figure 2. Representative volumetric water content in the top 57mm of soil over a 7 day period at 100% ET irrigation rate applied every 1,2,4, and 7 days. Blue arrows represent irrigation events.

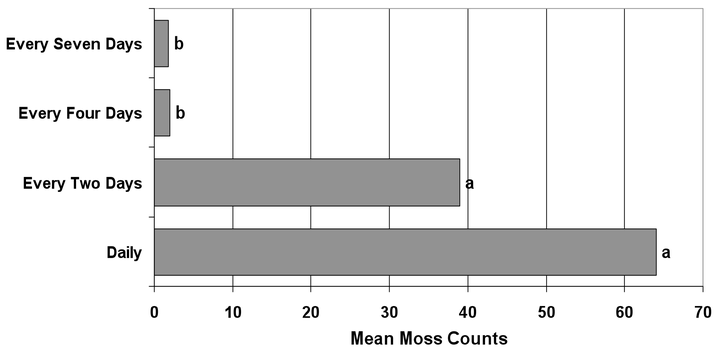

Figure 3. Average number of moss counts from 100% ET watered pots that were watered every 1, 2, 4, and 7 days. Each mean is an average of 4 replicates. Bars with different letters are significantly different (Tukeys LSD at α=0.05)

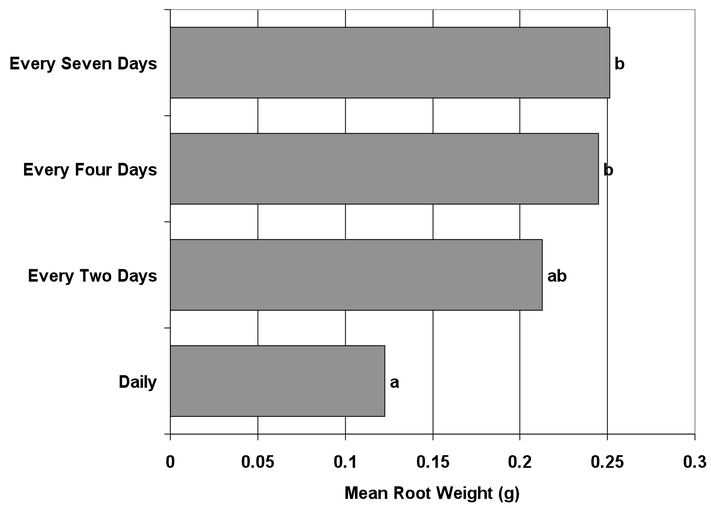

Figure 4. Average root mass of creeping bentgrass below 120mm of depth from 100% ET watered pots that were watered every 1, 2, 4, and 7 days. Each mean is an average of 4 replicates. Bars with different letters are significantly different (Tukeys LSD at α=0.05)

Results

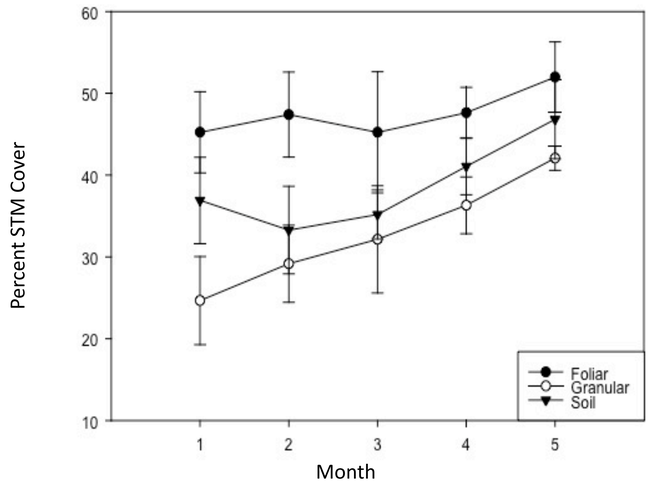

Figure 5. Percent cover of silvery thread moss (STM) under foliar, granular and soil applied liquid when grown with creeping bentgrass. Error bars represent standard error of 4 replicates.

Conclusions

- Different rates (75% vs 100%) had no effect on moss growth
- Watering daily and every two days increased the incidence of moss compared to more infrequent watering treatments Watering less frequently also increased the root mass of creeping bentgrass compared to daily watering
- Foliar fertilizers increased the percent cover of the silvery thread moss over soil applied and granular fertilizers
- The application of water and nutrients at the surface of the soil may increase the competitiveness of moss because its lack of ability to compete for resources when they are found deeper in the rootzone.

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