Alternative Products for Silvery-Thread Moss Control in Creeping Bentgrass

By Cole Thompson, Jack Fry and Megan Kennelly

Silvery-thread moss is a common weed in creeping bentgrass putting greens. Quicksilver (carfentrazone-ethyl) has been found to reduce silvery-thread moss populations and has become a standard for comparison for alternative moss control strategies.

Numerous studies have evaluated alternative products for silvery-thread moss suppression. Dishwashing detergent (Dawn Ultra, Ajax) and hydrated lime have been found to reduce moss populations; however, phytotoxicity of creeping bentgrass has been an issue. Several researchers have reported moss suppression with baking soda.

Settle et al. found that baking soda dissolved in water and applied with a hand-held trigger-spray bottle to wet moss colonies twice, two weeks apart in the spring, effectively controlled moss for the entire season. Kennelly et al. reported that spot treatment with baking soda at the same interval as Settle was as effective in moss suppression as Quicksilver. However, slight phytotoxicity to creeping bentgrass on the moss colony margins was observed for up to 14 days after treatment.

More research is needed into alternative products for silvery-thread moss control. Lower concentration spot treatments of baking soda and similar products may reduce moss populations while minimizing phytotoxicity to creeping bentgrass. It may also be possible to use baking soda in broadcast applications to reduce labor.

Alternative silvery-thread moss controls

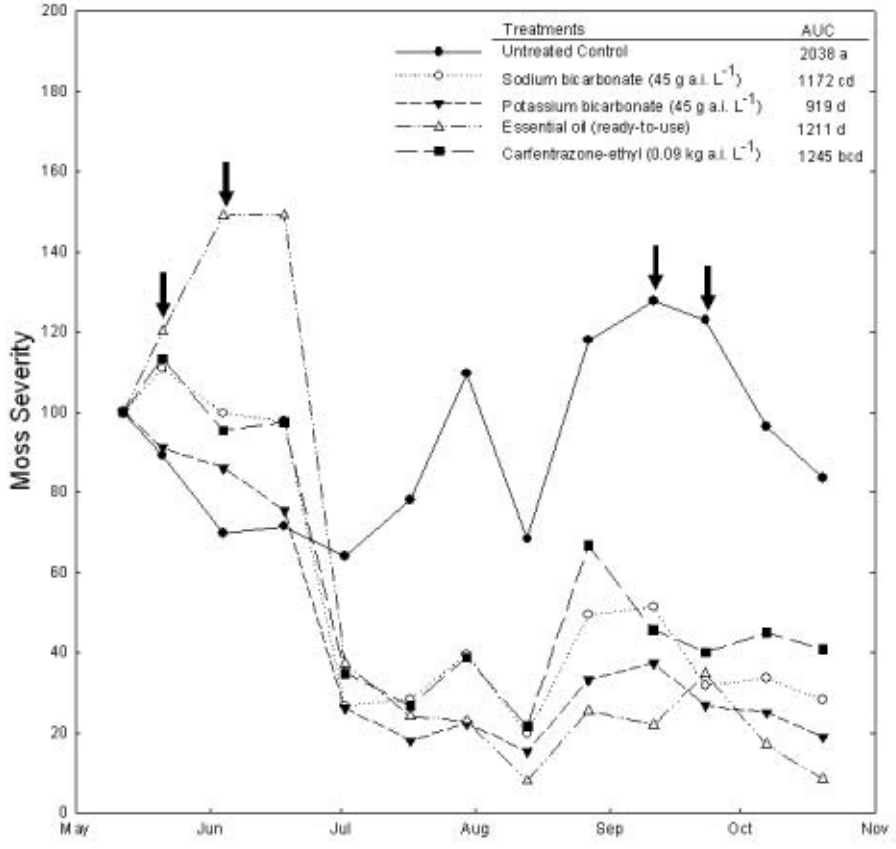
A field study was conducted in 2009 and 2010 at the Rocky Ford Turfgrass Research Center in Manhattan, Kan. Treatments consisted of an untreated control and eleven spot or broadcast applications: baking soda applied as a spot spray at 3 and 6 oz. gal^{-1} or as a broadcast at 18 and 36 oz. per 1,000 square feet; Armicarb (potassium bicarbonate), applied as spot-sprays at 3 or 6 oz. per gallon or as broadcast treatments at 1.8, 4.4, and 36 oz. per 1,000 square feet; Moss Buster [ready-to-use 1% essential origanum oil (i.e. oil of oregano)] was applied as a spot spray following label instructions; and Quicksilver broadcast at 0.14 oz. per 1,000 square feet.

Spot spray treatments were applied to individual colonies with a hand-held trigger-spray bottle until moss colonies were visibly wet. Broadcast sprays were applied using a hand-held CO_2 -powered sprayer. Baking soda (18 and 36 oz. per 1,000 square feet) and Armicarb (4.4 and 36 oz. per 1,000 square feet) were applied in a water carrier rate equal to 6 gallons per 1,000 square feet to increase the coverage and uniformity of applied treatment solutions, while Armicarb (1.8 oz. per 1,000 square feet) and Quicksilver (0.14 oz. per 1,000 square feet) were applied following label specifications at water carrier rates equal to 2.5 gallons per 1,000 square feet and 2 gallons per 1,000 square feet, respectively. All treatments were applied twice in the spring and fall of each year with two weeks between application dates.

Plots were rated every two weeks for percent moss coverage and creeping bentgrass color from May 12 to October 20, 2009; and from May 14 to October 13, 2010. Creeping bentgrass color data were also collected 1 and 7 days after treatment. Entire plots were rated for creeping bentgrass color using a 1 to 9 scale with 1 being totally brown, 6 minimum acceptable color, and 9 optimum green color. Percent moss coverage was rated visually by estimating the percent of each plot infested by silvery-thread moss.

Percent moss coverage differed among plots at the beginning of the study in each year. Thus, moss coverage was considered to be 100% at the time of the initial rating and moss severity for later rating dates was scaled accordingly. Area under the curve (AUC)

FIGURE 1: EFFECT OF TREATMENTS ON MOSS SEVERITY IN 2009



Treatments that reduced moss severity compared to untreated are displayed, and arrows signify application dates. Moss severity is a visual estimate of the percent of research plots infested with moss. Moss levels were significantly different on the first rating date. For this reason estimates for each plot were set to equal 100% on the first rating date. Means followed by the same letter are not significantly different (P < 0.05), according to Fisher's Protected LSD.

analysis was conducted on moss severity data to give a cumulative, season-long indication of moss severity.

Effect of treatments on silvery-thread moss severity

No treatment completely eliminated silvery-thread moss in either 2009 or 2010. According to AUC analysis in 2009, spot application with baking soda (6 oz. per gallon), Armicarb (6 oz. per gallon) or Moss Buster, as well as broadcast applications of Quicksilver, reduced moss severity 39% to 55% compared to untreated plots and were not statistically different from each other (Fig. 1).

Applying Quicksilver to moss temporarily turned it black; moss treated with baking soda, Armicarb or Moss Buster changed from green to reddish brown (Figs. 2-4).

With the exception of those treated with Armicarb, Moss Buster-treated plots had significantly lower moss severity than all other treatments on the final rating date in 2009 (October 20) and reduced moss severity to 8.4, from the starting point of 100 (Fig. 1).

Baking soda had significantly higher moss severity on this date than Moss Buster, and with a moss severity rating of 25.3, was still significantly lower than untreated. Conversely, baking soda and Armicarb (spot sprayed at 3 oz. per gallon); and broadcast applications of baking soda (18 and 36 oz. per 1,000 square feet), Armicarb (1.8, 4.4, and 36 oz. per 1,000 square feet), and Quicksilver were not significantly different from untreated plots, which had a moss severity value of 82.7, relative to the starting point of 100.

In 2010, no treatment reduced silvery-thread moss compared to untreated plots, according to AUC analysis (data not shown).

Influence on bentgrass color

Of the treatments effective in suppressing moss in 2009, Quicksilver was the only one that caused no visible phytotoxicity to creeping bentgrass in either 2009 or 2010 (Fig. 2).

Spot treatments of Moss Buster were most phytotoxic, resulting in color ratings below 4 within one day after application and requir-

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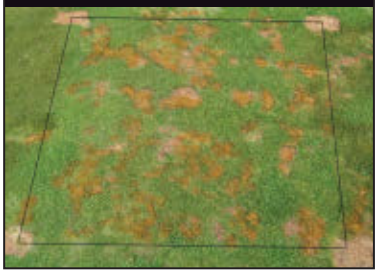
FIGURE 2

Silvery-thread moss on 22 May 2009, one day after treatment with Quicksilver (0.14 oz. 1,000 ft^{-2}) on 21 May. Note the lack of creeping bentgrass phytotoxicity.

FIGURE 3



Silvery-thread moss and associated creeping bentgrass phytotoxicity on perimeters of moss colonies on 5 June 2009, one day after spot treatment with Armicarb (6 oz. gal^{-1}). Baking soda applications had similar effects on moss colonies.

FIGURE 4

Silvery-thread moss and associated creeping bentgrass phytotoxicity on perimeters of moss colonies on 22 May 2009, one day after spot treatment with Moss Buster.

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ing up to 18 days to return to acceptable color (data not shown). In 2009, creeping bentgrass color in essential-oil treated plots was acceptable on 71% of rating dates, and in 2010 on 41.2% of rating dates.

Creeping bentgrass color after treating moss with spot applications of baking soda (6 oz. per gallon) was variable. In 2009, creeping bentgrass color was acceptable on 76% of rating dates. Recovery time following creeping bentgrass injury with baking soda ranged from 1 to 7 days. In 2010, no adverse effects of applying baking soda were observed. Phytotoxicity was observed after treating moss with Armicarb in 2009 and 2010, and creeping bentgrass color was acceptable on 82.4% in both years. Recovery time following creeping bentgrass injury associated with PB ranged from 1 to 8 days.

Spot treatment with baking soda or Armicarb at reduced concentrations (3 oz. per gallon) was not phytotoxic to creeping bentgrass, nor were broadcast treatments with baking soda (18 oz. per 1,000 square feet) or Armicarb at lower rates (1.8 or 4.4 oz. per 1,000 square feet).

Conclusions

Two spring and two fall applications with spot treatments of baking soda (6 oz. per gallon), Armicarb (6 oz. per gallon), or Moss Buster, as well as broadcast applications of Quicksilver, were shown to reduce moss severity in the first year of this two-year study.

Spot treatments of bicarbonate-based products and Moss Buster have the potential to serve as alternatives for moss control and can suppress moss colonies at a level similar to Quicksilver. However, turf phytotoxicity can occur when using baking soda or Armicarb, and severe phytotoxicity is possible when using Moss Buster.

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