TURFGRASS TRENDS

SHADE TOLERANCE

N Rate and Primo Maxx Effects on Shade Tolerance

By Ben Pease

Management of shaded creeping bentgrass (*Agrostis stolonifera*) requires extensive inputs to maintain acceptable quality. Current pressure to reduce inputs associated with golf course turf comes from many angles. Velvet bentgrass (*Agrostis canina*) is a possible alternative to creeping bentgrass (CBG) in shaded putting green situations.

Velvet bentgrass (VBG) was widely used in research through the 1970s and more widely used on golf courses in the first half of the 20th century, but the introduction of CBG seed in the mid-1950s initiated a shift in management practices that favored CBG over VBG, resulting in the near abandonment of VBG. VBG is anecdotally the most shade tolerant bentgrass, but that's never been quantified and management practices have never been evaluated in shaded conditions.

The purposes of our trial were to compare the shade tolerance of CBG and VBG and to begin investigating cultural management of shaded VBG. Our objectives were to determine how N rate and trinexapac-ethyl (TE) application affect the agronomic characteristics of both species subjected to 80% shade. We hypothesized that VBG would maintain higher quality than CBG under 80% shade and that lower N rates would favor VBG over CBG. We also hypothesized that both bentgrass species would react similarly to TE.

Native soil push-up greens were constructed at the O.J. Noer Turfgrass Research and Education Facility near Madison, Wis., in spring 2008. Support structures for the shade cloth were then installed and the field plots were seeded on July 3, 2008. Cultivars used were Vesper VBG and Tyee CBG, both seeded at 1.2 pounds per 1,000 square feet. Prior to seeding, the study area was fertilized with 0.5 pounds P per 1,000 square feet (15-11-7 NPK) to aid establishment. Plots were irrigated for two minutes, five times daily until turf germination appeared complete. Beginning Aug. 1, 2008, irrigation was reduced to once-daily 75% ET replacement.

Grow-in

The study area was fertilized with 0.5 pounds N per 1,000 square feet on seven dates between July 20 and Nov. 7, 2008 to aid establishment (34-0-11 NPK). Beginning July 17, 2008, turf was mowed at 0.5-inch height of cut with clippings returned

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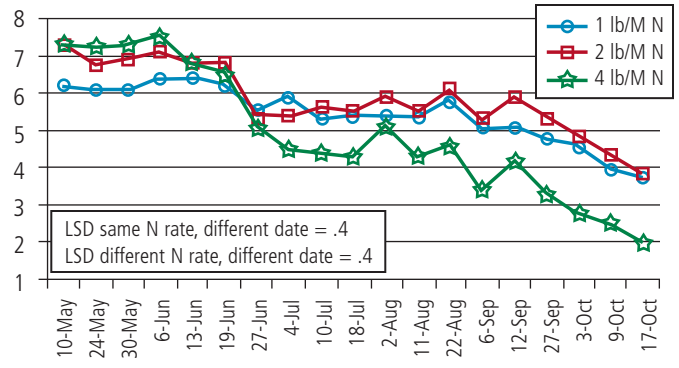
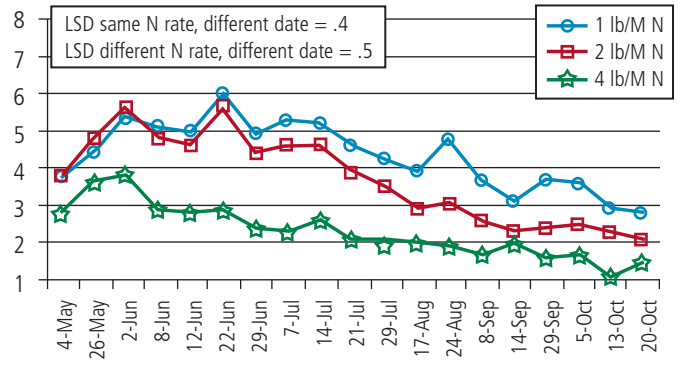
FIGURE 1: TURFGRASS QUALITY (1-9)



2009 Rating Date — A



2009 Rating Date — B

Quality of shaded bentgrass putting green turf in (A) 2009 and (B) 2010 as affected by N rate and rating date. Fertilizer treatments were applied at 14-day intervals beginning May 1, 2009 and May 3, 2010. Quality was rated on a 1-9 scale, with 1 = completely necrotic turf; 5 = minimal acceptable putting green turf; and 9 (not shown) = optimal density, uniformity and color.

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using a walk-behind reel mower. The cutting height was reduced to 0.165-inch by Sept. 24, 2008. This height was maintained for the remainder of 2008.

Treatments were arranged in a randomized, complete block, split-split plot design with four replications. Main plots were bentgrass species (CBG or VBG). Each main plot was split to receive three annual N rates (1, 2, and 4 pounds per 1,000 square feet) and two annual TE (Primo Maxx) rates (0.0 and 0.875 ounces per 1,000 square feet). Nitrogen was applied every 14 days using TeeJet XR8002VS nozzles in water equivalent to 1.0 gallon per 1,000 square feet, beginning May 1, 2009 and May 3, 2010. Fourteen equal applications were made each year. Trinexapac-ethyl was applied every 28 days using the same equipment and water rate as the N treatments, beginning May 15, 2009 and May 3, 2010. Seven applications were made each year.

Irrigation was applied four days per week at 60% ET replacement beginning May 2009. By August 2009, ET replacement was reduced to 40% because the dense shade cover greatly decreased the water needs of the turf system. Plots were mowed each morning six days each week, with clippings removed. Height of cut was 0.125 inch for both growing seasons. Light topdressing occurred monthly during both growing seasons using USGA sand root zone mix.

Shade cloth was installed on hoop houses arching over the plot area from May 10 to Oct. 25, 2009 and from May 13 to Oct. 18, 2010 to reduce photosynthetic active radiation by approximately 80%. The installment and removal dates corresponded with local spring tree leaf development and fall tree leaf senescence.

Turfgrass quality was rated on a 1-9 scale, with 1 = dead turf; 5 = minimal acceptable putting green turf; and 9 = optimal density and uniformity. Relative chlorophyll index, clipping yield and ball roll distance data were measured/collected but will not be addressed here. Data were subjected to ANOVA using repeated measures analysis to determine significant treatment and year effects. Because year by treatment interactions occurred, data were analyzed separated by year. Treatment means were separated with Fisher's least significance (LSD) test at the 0.05 probability level when *F* tests indicated significant treatment effects.

Turf quality results

Rating date was significant in both years, along with its interaction with N rate, TE application, and bentgrass species. In 2009, all N rates provided acceptable quality through June 26 (Fig. 1A); 4 pounds per 1,000 square feet N was below acceptable quality for the

remainder of 2009 except on August 1. Turf fertilized at 2 pounds per 1,000 square feet N maintained acceptable quality through September 26 while the 1 pound per 1,000 square feet N rate resulted in unacceptable quality beginning September 11. Prior to June 26, the 2 and 4 pounds per 1,000 square feet N rates usually produced similar turf quality.

After June 26, turf fertilized with the 1 and 2 pounds per 1,000 square feet N rates usually had similar quality. In 2010, the 4 pounds per 1,000 square feet N rate produced unacceptable turf quality on all rating dates and had lower quality than the other N rates on all dates except September 13 (Fig. 1B). The 1 and 2 pounds per 1,000 square feet N rates also began the year at unacceptable quality but recovered to acceptable quality by June 1, although the 2 pounds per 1,000 square feet N rate returned to unacceptable quality for the remainder of the year except on June 21.

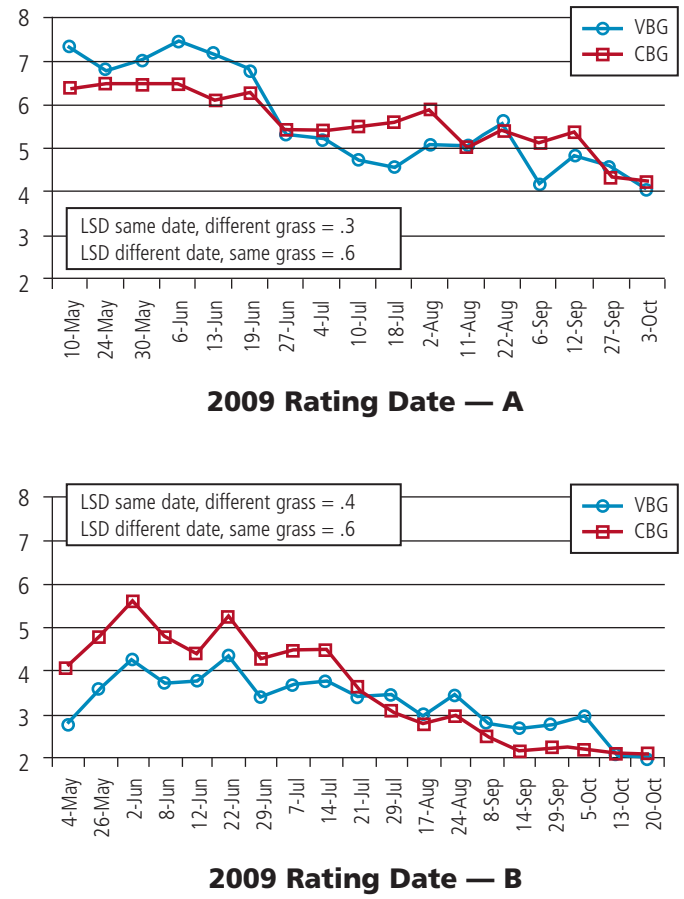
The 1 pound per 1,000 square feet N rate maintained acceptable quality only through June 21 and July 6 through July 13. Beginning on July 6, 1 pound per 1,000 square feet N always had significantly higher quality than 2 pounds per 1,000 square feet N.

In 2009, both TE treatments were similar in quality on most dates prior to June 18 (≥6.5). Beginning June 18, TE-treated turf had significantly higher quality than non-TE-treated turf through October 8. TE-treated turf maintained acceptable quality through September 11 while non-TE-treated turf maintained acceptable quality only through June 18 (data not shown). In 2010, TE-treated turf had significantly higher quality than non-TE-treated turf on 7 of 19 rating dates.

Only TE-treated turf had acceptable quality on two dates (June 1 and 11), although on June 1 TE- and non-TE-treated turf were of similar quality (≥4.8).

In 2009, VBG maintained acceptable quality through July 3 and from August 1 to August 21, while CBG maintained acceptable quality through September 11 (Fig. 2A). Prior to June 26, VBG had significantly higher quality than CBG on most rating dates. After July 3, CBG had significantly higher quality than VBG or the two species were of similar quality. In 2010, CBG was the only species to achieve acceptable quality, although only on June 1 and 21 (Fig. 2B).

FIGURE 2: TURFGRASS QUALITY (1-9)



Quality of shaded bentgrass putting green turf in (A) 2009 and (B) 2010 as affected by bentgrass species and rating date. TE treatments were applied at 28-day intervals beginning May 15, 2009 and May 3, 2010. Quality was rated on a 1-9 scale, with 1 = completely necrotic turf; 5 = minimal acceptable putting green turf; and 9 (not shown) = optimal density, uniformity and color.

Conclusions

Sometimes CBG had better quality than VBG, refuting our hypothesis that VBG would maintain higher quality than CBG under shaded conditions. This may be a cultivar effect.

Both bentgrass species reacted similarly to N rate and both benefitted from lower N rates while under shaded conditions. Agreeing with our hypothesis, both bentgrass species benefitted from the application of TE.

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