Reducing Ultradwarf Bermudagrass Putting Green Winter Injury with Covers and Wetting Agents

Eric J. DeBoer*, Michael D. Richardson, Douglas E. Karcher and John H. McCalla
University of Arkansas, Department of Horticulture, Fayetteville, AR 72701

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

INTRODUCTION

As ultradwarf bermudagrass (*Cynodon dactylon x Cynodon transvaalensis)* putting greens move further north in the transition zone, there is an increased risk of sustaining winter injury from low temperature exposure and crown desiccation. The benefits of utilizing covers for winter protection are well documented but there are significant labor costs associated with covering and uncovering greens during the winter to allow for play during favorable weather. While the current recommendation is to cover bermudagrass greens when the low temperature is forecasted to drop to -4 °C (O'Brien and Hartwiger, 2013), it may be possible to lower this forecasted temperature, resulting in fewer covering events, reduced labor costs and more days open for play.

Localized dry spot (LDS) is a common problem on sand-based putting greens and can lead to desiccation of the turfgrass crown and even death of the plant. Symptoms of LDS are easily recognized when turf is actively growing but may not be apparent while the turf is dormant. Wetting agents are commonly applied during the growing season to combat effects of LDS but little information exists on the effects of a late-fall/early-winter wetting agent application on winter survival and spring green-up of ultradwarf bermudagrass.

OBJECTIVES

- Examine predicted low-temperature thresholds for covering Tifeagle, Champion, and Mini-Verde ultradwarf bermudagrass putting greens
- Investigate the effects of a late-fall wetting agent application on soil moisture and winter survival of ultradwarf bermudagrass

MATERIALS AND METHODS

Location: Arkansas Agricultural Research and Extension Center, Fayetteville, AR.
Cultivars: 'Champion', 'Mini-Verde', and 'Tifeagle' ultradwarf bermudagrass (4 x 12.2 m)
Cover composition: Black, woven polypropylene covers (Xton Inc. Florence, AL) (2.4 x 12 m)
Cover treatments - forecasted low temperature thresholds: Covers placed when lows are predicted of -9.4, -7.8, -5.6 or -4.0 °C and an uncovered control. Covers removed when daytime high exceeds 7.2 °C (Photo 1).
Wetting Agent: One application on Dec. 7 - Revolution (Aquatrols) at 1.9 ml m^{-2} (1.2 x 4 m)
Experimental Design: Strip split plot – Cover treatments were applied as strip plots across cultivars. Cover x cultivar plots were further split with the wetting agent treatment.
Data Collected: % Green Turfgrass Coverage -Digital image analysis
Soil Volumetric Water Content - Spectrum TDR 300 – 3.8 cm rods

Photo 1. Cover treatments applied across all plots

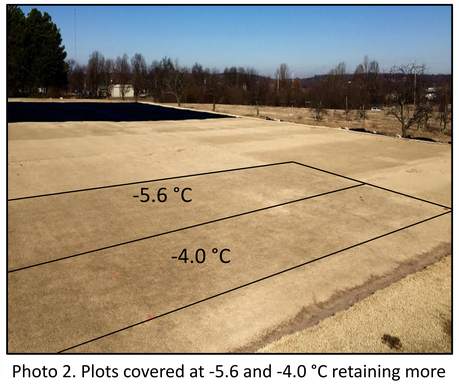


Photo 2. Plots covered at -5.6 and -4.0 °C retaining more color than other treatments.

RESULTS/DISCUSSION

Environmental conditions: Fayetteville, AR experienced an unseasonably warm winter for 2015-2016 (Figure 1). This should be taken into consideration when analyzing preliminary data.

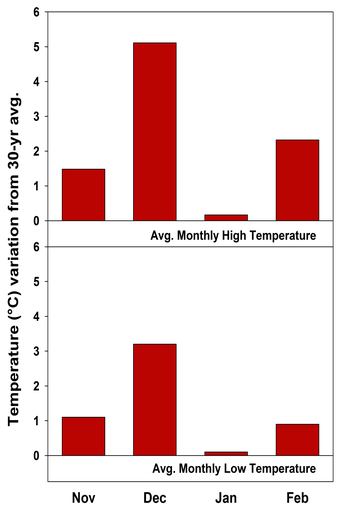


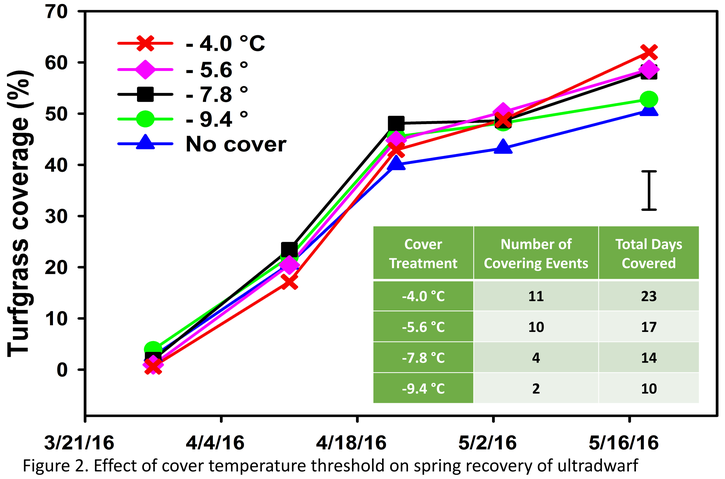
Figure 1. Temperature trends for the winter of 2015-2016 in Fayetteville, AR

Table 1. Analysis of variance for treatment effects and interactions on % green turfgrass coverage

Effect	DF	*Pr* > F
Block	3	0.729
Cultivar	2	0.0708
Covers	4	0.794
Cultivar*Covers	8	0.8787
Wetting agent (WA)	1	<0.0001
Cultivar*WA	2	0.6115
Covers*WA	4	0.8572
Cultivar*Covers*WA	8	0.0136
Day of year (DOY)	11	<0.0001
Cultivar*DOY	22	<0.0001
Covers*DOY	44	<0.0001
Cultivar*Covers*DOY	88	1
WA*DOY	11	<0.0001
Cultivar*WA*DOY	22	0.9412
Covers*WA*DOY	44	1
Cultivar*Covers*WA*DOY	88	0.9993

Statistical analysis: A repeated measures analysis of variance using Proc Mixed (SAS V. 9.3) included day of year (DOY) in the analysis. Significant interactions were observed for cultivar x DOY, covers x DOY, and wetting agent x DOY on turfgrass coverage during spring green-up (Table 1). As such, all results will be discussed based on those interactions.

Cover effects: Covers produced significantly faster spring green-up compared to the uncovered control on several dates (Figure 2). Throughout the winter, plots covered at -5.6 or -4.0 °C retained more color than other treatments (Photo 2). Reducing the temperature threshold for covering led to fewer covering events and total number of days greens were covered (Figure 2).



Cover Treatment	Number of Covering Events	Total Days Covered
-4.0 °C	11	23
-5.6 °C	10	17
-7.8 °C	4	14
-9.4 °C	2	10

Figure 2. Effect of cover temperature threshold on spring recovery of ultradwarf bermudgrass. Error bar represents the least significant difference for comparing means *(P=0.05)*

Cultivar effects: 'Tifeagle' and 'Mini-Verde' achieved significantly greater spring green-up than 'Champion' (Figure 3, Photo 3). Spring green-up and visual quality ratings were not significantly different between 'Mini-Verde' and 'Tifeagle'.

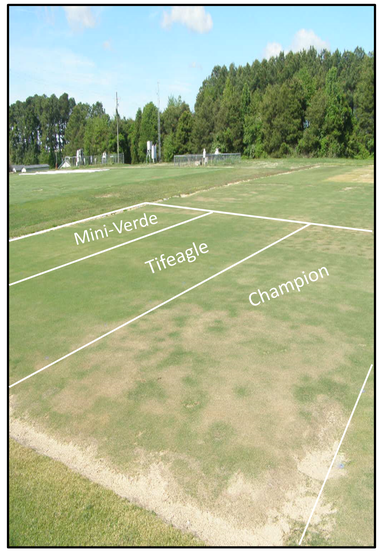


Photo 3. Cultivar effect on spring green-up

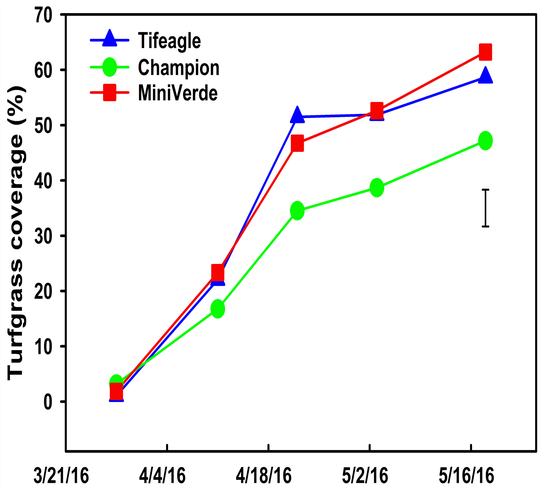


Figure 3. Effect of cultivar on spring recovery of ultradwarf bermudagrass greens. Error bar represents the least significant difference for comparing means *(P=* 0.05)

Wetting agent application: Plots receiving a late season wetting agent application had significantly greater green turfgrass coverage at every date after the first observation date (Figure 4, Photo 4). Decreases in green turf coverage were observed on a couple of dates due to late-season frost events after green-up had initiated.

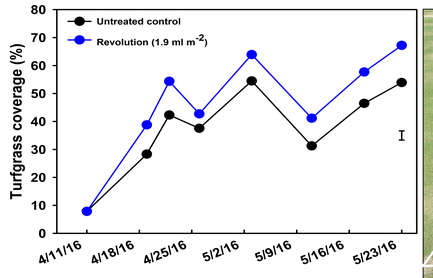


Figure 4. Effect of a late-fall wetting agent application on the spring recovery of ultradwarf bermudagrass greens. Error bar represents the least significant difference for comparing means *(P=* 0.05).

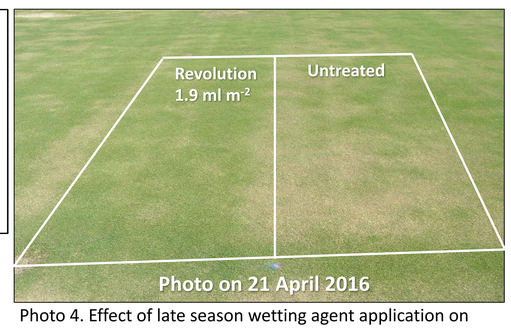


Photo 4. Effect of late season wetting agent application on spring green-up

CONCLUSIONS

- 'Tifeagle' and 'Mini-Verde' experienced less winter injury than 'Champion'
- The use of protective covers enhanced spring green-up and recovery for all cultivars
- Reducing the threshold temperature for covering reduced the number of covering events during the winter
- A late season wetting agent improved spring green-up

REFERENCES

O'Brien, P., and C. Hartwiger. 2013. Covering guidelines for ultradwarf bermudagrass putting greens. United States Golf Association. January 9. p. [1].

ACKNOWLEDGMENTS

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