Drought Tolerance of 15 Bermudagrass Cultivars

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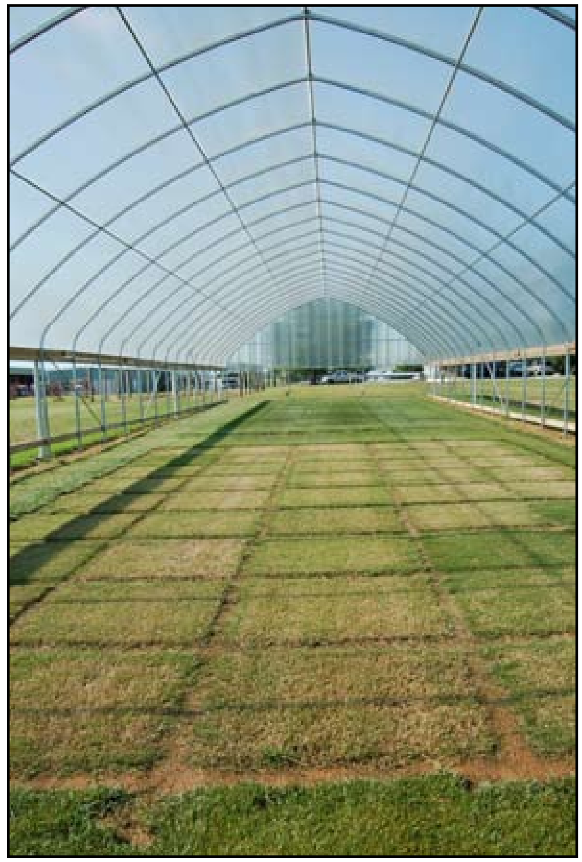

Photo by Mike Richardson

Bermudagrass plots during a drought trial in 2009.

Summary. Newer cultivars of seeded bermudagrass may have improved drought tolerance over standard cultivars. The objective of this research was to compare the drought tolerance of cultivars and experimental lines of bermudagrass under lawn maintenance conditions. Cultivars were established in the spring of 2008 and dried down during the summer of 2009 in a fixed-roof rain-out shelter, which prevented rainfall from reaching the plots. Green turf coverage was evaluated twice weekly as the cultivars were subjected to drought stress. Compared to earlier studies on cool-season grasses, which often show drought stress symptoms in 2-3 weeks, it took over 40 days without water before bermudagrass cultivars began losing significant green coverage. Although there were significant differences between cultivars, the range between the best and worst cultivars was approximately 12 days, suggesting that there is less variability in drought tolerance among bermudagrass as compared to earlier studies on cool-season species.

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A desirable trait in lawn grasses is that they stay green during short periods of drought, as this can save significantly on irrigation needs. Bermudagrass is the most widely-used lawn grass in Arkansas and is adapted across the entire state. Although bermudagrass is generally considered to have good drought tolerance, there have been minimal studies that have attempted to document differences in drought tolerance between bermudagrass cultivars. Over the last five years, our research program has developed techniques that allow us to screen grasses for drought tolerance and we have demonstrated a wide variation in drought tolerance among cultivars of tall fescue (Karcher et al., 2008) and Kentucky and hybrid bluegrass species (Richardson et al., 2008; Richardson et al., 2009). The following research was initiated to compare the relative drought tolerance of 15 bermudagrass cultivars and experimental entries.

Materials and Methods

This research was conducted at the University of Arkansas Agricultural Research and Extension Center in Fayetteville, Ark. Fifteen cultivars and experimental entries of bermudagrass (Table 1) were either seeded (1.0 lb/1000 ft^2) or sprigged (sprigs planted on 12-inch centers) into three replicate plots in the spring of 2008 on a native soil experimental area that was constructed under a fixed-roof rain-out shelter. The experimental area was maintained as a home lawn and was mowed weekly at a 2-inch height of cut. On 26 June 2009, the experimental area was saturated with 2 inches of irrigation to ensure uniform soil moisture across the plots. Immediately thereafter, drought stress was initiated by discontinuing irrigation, and the rain-out shelter prevented any rainfall from reaching the plots. Digital images were collected from each plot regularly during drought stress to evaluate green turf coverage over time and determine the drought tolerance characteristics of each cultivar. Non-linear regression (using a variable slope, Sigmoid curve) was performed on the digital image analysis data to predict $Days_{75}$, $Days_{50}$, and $Days_{25}$ values for each cultivar, which are the estimated number of days after irrigation was withheld until green turf coverage decreased to 75%, 50%, or 25%. A complete description of digital image analysis and statistical methods are presented elsewhere (Karcher et al., 2008).

Results and Discussion

The number of days after irrigation was withheld until green turf coverage dropped to 75% ranged from 45 d for SWI-1122 to 58 d for SWI-1113. This range of 13 d is considerably smaller than what has been observed in similar tests on cool-season grasses, suggesting that the range of drought tolerance may be smaller in existing bermudagrass germplasm compared to cool-season grasses such as tall fescue or bluegrass. However it should still be noted that the first signs of drought stress in the weakest bermudagrass cultivars were not observed until 45 days after irrigation was withheld, and the overall drought tolerance of bermudagrass as a species is much greater than cool-season grasses.

The trends in drought tolerance among cultivars were similar at all evaluation levels, with the exception of SWI-113, which performed better at the 25% green coverage evaluation, while dropping in performance at 75% green coverage (Fig. 1). However, there were minimal statistical differences between any cultivars at the 25% green coverage evaluation. One interesting observation was that Tifway, a vegetatively-propagated standard cultivar, was one of the best entries tested in this trial and was in the top statistical group at each evaluation period. It would be desirable in future studies to examine a broader range of seeded and vegetative cultivars to determine if there are true differences between hybrid and seeded cultivars.

Conclusions

These results demonstrate that there are differences in drought tolerance among bermudagrass cultivars, although the range in differences was less than observed with cool-season grasses. These studies will be repeated in the 2010 growing season for confirmation.

Literature Cited

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Table 1. Bermudagrass entries tested in drought tolerance trial.

Entry	Propagation method
Tifway	Vegetative
SWI-1083	Seeded
SWI-1070	Seeded
SWI-1113	Seeded
NuMex-Sahara	Seeded
Princess-77	Seeded
PST-R62530	Seeded
PST-R6ON	Seeded
SWI-1081	Seeded
PST-R6LA	Seeded
PST-R6FLT	Seeded
PST-R6EY	Seeded
Transcontinental	Seeded
SWI-1117	Seeded
SWI-1122	Seeded

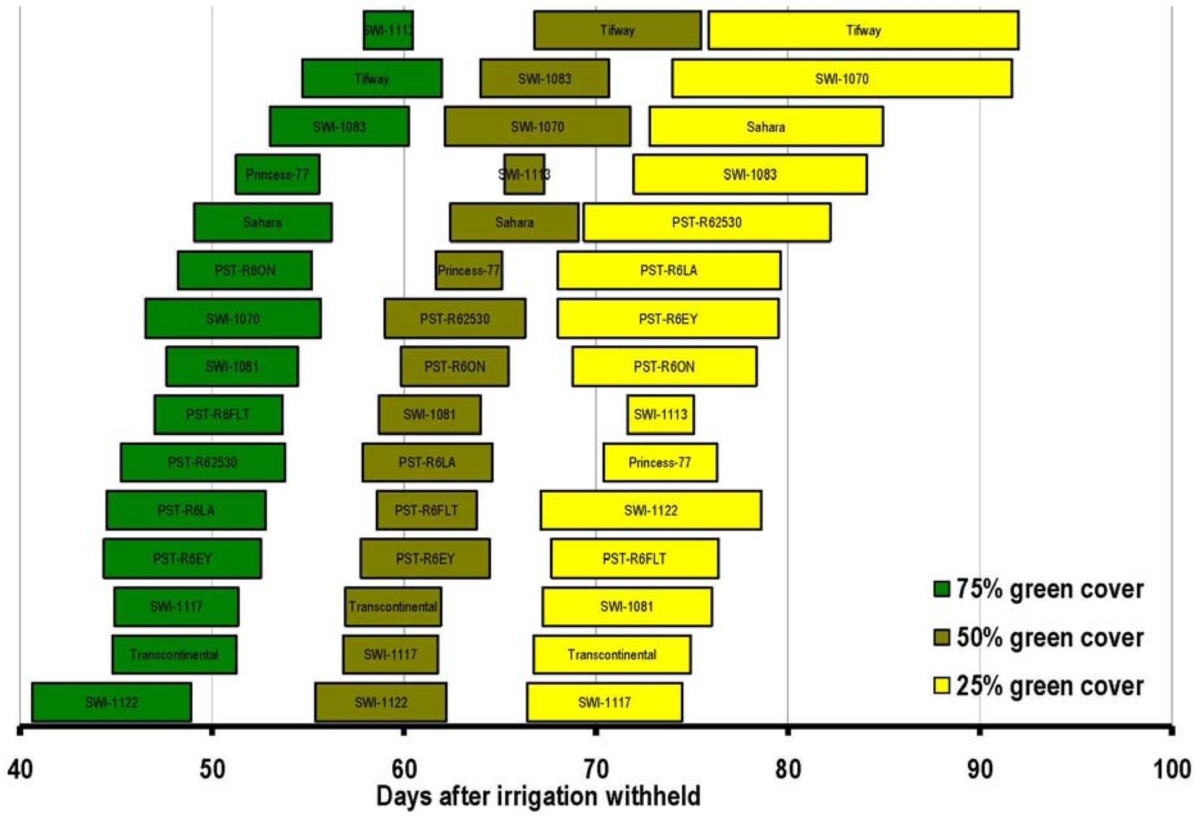

Fig. 1. Drought tolerance of 15 bermudagrass entries, as measured by days without water required to reach 75%, 50%, or 25% green cover.