Hybrid bluegrass vs. *Kentucky blue* and *tall fescue* in transition zone

By Dale J. Bremer, Kemin Su, Steven J. Keeley, and Jack D. Fry

Bill Snyder Family Stadium, courtesy Kansas State University Athletic Department

In some areas of the United States, Kentucky bluegrass and tall fescue are subjected to frequent drought, which results in heat and drought stress symptoms, and irrigation is required to maintain acceptable quality. Kentucky bluegrass (KBG) commonly goes dormant during periods of high temperature and drought. Tall fescue (TF) has good drought avoidance because of its relatively deep rooting system, but some turfgrass managers prefer the finer texture and recuperative capacity that KBG offers.

New hybrid bluegrass (HBG) cultivars, which are genetic crosses between KBG and native Texas bluegrass, have the appearance of KBG but may be able to withstand higher temperatures and extended drought without going dormant. In warm climates HBG may stay green all year long. Furthermore, HBG may use less water than other cool-season species while maintaining their green color. This is especially important given the increasing competition for water and the rising costs of irrigation.

In our 2-year study, two HBG were compared with KBG and TF in the stressful climate of the transition zone. The objectives were to evaluate KBG (Apollo), TF (Dynasty), and two cultivars of HBG (Thermal Blue (HBG1) and Dura Blue (HBG2)) for: 1) canopy establishment rates after fall seeding; 2) visual quality and growth characteristics of canopies; and 3) drought resistances under different irrigation regimes and deficits.

The study was conducted from September 2002 to October 2004 at the Rocky Ford Turfgrass Research Center near Manhattan, KS. The soil at the site was Chase silt loam (fine, smectitic, mesic-Aquertic, Argiudolls). Thirty-six subplots were established in a split-plot design. Two irrigation treatments and a control, replicated three times each, were applied to whole plots arranged in a Latin square design. Four species or cultivars of turfgrasses were established in the subplots. One species/cultivar of each turfgrass was planted once within each whole plot; species/cultivar was randomly assigned to subplots within each whole plot. Therefore, each irrigation-by-species/cultivar treatment combination was replicated three times in the entire study.

Irrigation treatments included the replacement of 100 and 60% of the water lost from plants and soil via evapotranspiration (ET), and control plots received only natural precipitation. Water was applied twice weekly through a fan spray nozzle attached to a hose; a meter was attached to ensure proper application rate. To determine irrigation requirements, evapotranspiration (ET) was calculated by using the Penman-Monteith equation, and climatological data were obtained at a weather station located at Rocky Ford.

In 2003, irrigation treatments were not applied because of a moderate billbug infestation that affected a number of plots of KBG, HBG1, and HBG2 despite insecticide applications. Plots in 2003 were irrigated every 3-4 days, providing 40 mm of water per week in the absence of rain, to minimize stress related to billbug damage. Therefore, irrigation treatments were applied for only one year (2004) of the study.

Canopy evaluations

Turfgrass canopy establishment was evaluated visually after seeding, from 17 December 2002 to 20 July 2003. Establishment was estimated as percentage of the ground surface covered by turfgrass canopies within each plot (0 to 100%).

All plots were evaluated biweekly for visual turfgrass quality, which was rated on a scale from 1 (dead, brown turf) to 9 (optimum uniformity, density, and color) and 6 was considered acceptable quality for a home lawn; all evaluations in each year were conducted by the same person. Turfgrass density and color were also evaluated visually in each plot independent of, albeit less frequently than, quality during the same periods in 2003 and 2004.

Clippings were collected every 3 weeks, or 4 times from 5 August to 10 October in 2003, with a walk-behind rotary mower equipped with a modified collection bag that allowed for complete capture of clippings from each plot. Clipped biomass was determined gravimetrically after samples had been dried in a forced-air oven for 48 hours at 65 degrees C.


Kentucky bluegrass


Tall fescue turfgrass

Vertical growth rates were measured biweekly to monthly from 14 July to 21 October in 2003 and biweekly from 14 June to 12 August in 2004. Daily vertical growth rates were calculated as the increase in canopy heights between consecutive mowing events, divided by the number of days between mowing. Canopy heights were measured immediately after mowing at two randomly selected locations within each plot; each location was marked with a flag that remained until the next mowing date. Before the next mowing, canopy heights were measured a second time at the same (marked) locations. Canopy heights were measured by placing a circular piece of lightweight cardboard over the canopy and centered on the flag; the cardboard was rigid enough to hold its shape but lightweight enough to minimize the bending of the canopy by its weight. The height of the canopy was then measured at four perpendicular spots around the circumference of the cardboard. The flags were then removed before mowing and then reinserted at new, random locations for the next measurements.

Tests of differences in canopy establishment, visual quality, canopy color and density, clipping biomass, vertical growth rates, and irrigation effects among treatments were conducted with the mixed linear model procedure of SAS.

Plot maintenance

All plots were mowed with a walk-behind rotary mower at a height of 2.5 inches once or twice weekly as needed to prevent removing more than 1/3 of the canopy height. All plots were fertilized with approximately 225 kg urea N ha?1 yr?1 in 2003 and 2004, in split applications in September, November, May, and July. Because bluegrass billbug had infested some bluegrass plots at the research center in previous years, plots were treated in 2003 with 0.36 kg a.i. ha?1 of imidacloprid (1-(6-chloro-3-pyridylmethyl)-N-nitroimidazolidin-2-ylideneamine, 1-[(6-chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine) on 7 June and 0.09 kg a.i. ha?1 of bifenthrin (2-methyl-1,1-biphenyl-3-y1)-methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethyl cyclopropanecarboxylate) on 1 August, and in 2004 with 0.44 kg a.i. ha?1 of imidacloprid on 19 April, 0.125 kg a.i. ha?1 of bifenthrin on 27 May, and 1.69 kg a.i. ha?1 of halofenozide (Benzoic acid, 4-chloro-, 2-benzoyl-2-(1,1-dimethylethyl)hydrazide) on 9 July. Preemergence herbicide applications included 0.56 kg a.i. ha?1 of dithiopyr (/S, S/?-dimethyl 2-difluoromethyl-4-isobutyl-6-trifluoromethylpyridine-3,5-dicarbothioate) on 17 May 2003 and 27 May 2004. Broadleaf pests were treated as needed, and no fungicides were applied during the study.

Establishment was most rapid in TF, which was at 90% cover by 17 December 2002 and reached 100% by 7 May 2003. Both KBG and HBG1 established more slowly than TF and were similar to each other; HBG1 reached 99% cover by 13 June and KBG by 28 June. The HBG2 was slowest to establish, reaching 96% cover by 19 July. Percentage cover for HBG2 was lower than for TF, KBG, and HBG1 during the entire period of establishment evaluations. Establishment in TF was 99% complete 37, 52, and more than 73 days faster than in HBG1, KBG, and HBG2, respectively.

Visual quality was generally lower in the bluegrasses than in TF during 2003 and 2004. Mean quality, when averaged over the season, ranked TF>KBG>HBG1>HBG2 both years; all differences in mean quality among species or cultivars during the season were significant in both years, except between KBG and HBG1 in 2003.

The ranking of visual quality among species was, in part, a function of differences in canopy density and color. For example, canopy density was highest in TF and generally similar between KBG and HBG1 in both years, but a lighter color in HBG1 resulted in its lower quality rating in a number of instances. In 2003, quality in HBG2 was consistently lower among plots early in the growing season because of its slower establishment. Slower establishment in HBG2 resulted in a lower canopy density than in TF, KBG, and HBG1 up to 11 July 2003. Canopy density also was consistently lowest in HBG2 during 2004. Higher seeding rates may be required for HBG2 to obtain an adequate stand.

Vertical growth rates of HBG1 were similar to TF in 2003 and 2004,

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and were higher than KBG on three of four measurement dates in 2003 and on the last two dates in 2004. Averaged across the season, vertical growth rates of HBG1 were higher than those of KBG in 2003 and higher than those of KBG and HBG2 in 2004. It is clear that HBG1 shows little promise of reduced mowing frequency, compared with conventional cool-season species. The vertical growth rate of HBG2, by contrast, was more similar to KBG in both years. Averaged across the season, the vertical growth rate of HBG2 was lower than that of TF in 2003 and 2004 (albeit not significantly in 2004). Thus, there is potential for reduced mowing frequencies with HBG2 (and perhaps future cultivars of HBG), compared with TF.

Effects of water deficit

In 2004, frequent, above-average rainfall from May through August minimized the impact of water-deficit treatments; precipitation between June and August 2004 was 18.42 inches, which was 5.82 inches above normal. Drier (albeit cooler) weather during a 52-day period in September and October of 2004 allowed for a stronger comparison among species and cultivars under drought conditions; precipitation was 1.02 inches during September, which was 2.63 inches below normal, and only 0.27 inches occurred in early October before the study ended.

Visual quality ratings were similarly high among species and cultivars in well-watered plots at the end of the dry period in September and October 2004. Visual quality in the 60% ET treatment was significantly lower in HBG2 than in KBG, and quality in HBG1 and HBG2 was below the rating of 6 determined as acceptable for home lawns. In the control, which received only natural precipitation during this period (i.e., no irrigation), the quality of all bluegrasses was below 6 and ratings of KBG and HBG1 were significantly lower than those of TF. Visual quality in TF declined only from 8 to about 6.5 to 7 in the reduced-irrigation and control plots, indicating that TF was not substantially affected by drought in this study.

The lack of response of TF to water deficit may have been caused by a combination of deep soils at the research site and deep roots typical of TF that may extract soil water from lower in the profile. Higher quality in KBG than in HBG2 at 60% ET, and the lack of differences between KBG and HBG1 and HBG2 in the control, are in contrast to results from a study that reported higher quality in a HBG (Reveille) than in KBG (Bensun [A-34]) during prolonged dry down. The latter study also determined that the HBG had greater root length density and root mass in the 0- to 60-cm profile than the KBG had, and that greater dehydration avoidance was observed in the HBG than in KBG. Significant variation in drought resistance has been observed among cultivars of KBG and HBG however, and such differences among species and cultivars may have contributed to the contrasting results observed in our study. ■

Dale J. Bremer, Kemin Su, Steven J. Keeley, and Jack D. Fry, are with the Department of Horticulture, Forestry & Recreation Resources, Kansas State University. *This research was first reported in Applied Turfgrass Science in June 2006. Acknowledgements and Literature Cited are available at www.sportsturfonline.com.*

What it means to you

Our results indicate that tall fescue (TF) may be better suited than hybrid bluegrass (HBG) in areas of the transition zone where soils are deep, especially if drought resistance is a priority. Susceptibility of HBG to bluegrass billbug in this study also suggests that its maintenance costs may be higher than in TF, although other HBG cultivars not tested in this study may be more resistant to billbug damage. Because some cultivars of HBG also may exhibit higher drought resistance than others, further research is needed using new or different cultivars of HBG and in areas with different soils to more completely determine the potential for the use of HBG in the transition zone.