The Environmental Institute for Golf provided some of the funding for this research.

Comparison of performance of two hybrid bluegrasses with Kentucky bluegrass and tall fescue

Tall fescue may be more suited than hybrid bluegrass in areas of the transition zone where soils are deep, especially if drought resistance is a priority.

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Kentucky bluegrass (*Poa pratensis* L.) and tall fescue (*Festuca arundinacea* Schreb.) are cool-season turfgrass species used in lawns and golf courses in the United States (2,3). In some areas of the country, these grasses are subjected to frequent drought, which results in heat and drought stress symptoms, and irrigation is required to maintain acceptable quality. Kentucky bluegrass commonly goes dormant during periods of high temperature and drought (3). Although tall fescue has good drought avoidance because of its relatively deep rooting system, some superintendents prefer the finer texture and recuperative capacity that Kentucky bluegrass offers.

New hybrid bluegrass cultivars, which are genetic crosses between Kentucky bluegrass and native Texas bluegrass (*Poa arachnifera* Torr.), have the appearance of Kentucky bluegrass but may be able to withstand higher temperatures and extended drought without going dormant (1,8). Hybrid bluegrasses may use less water than other cool-season species while maintaining their green color (9), and in warm climates like those of the southern United States, they may stay green all year long (5).

Photo by D. Bremer

Figure 1. The experimental plots were located at the Rocky Ford Turfgrass Research Center near Manhattan, Kan.

Earlier research

Few scientific data are available about the performance of hybrid bluegrasses relative to Kentucky bluegrass and tall fescue under the stresses of different climates or cultural practices. One hybrid bluegrass, Thermal Blue, maintained higher quality than Dynasty tall fescue and Apollo Kentucky bluegrass under high temperatures in a growth chamber (8). In a field experiment in the upper Midwest, the mean quality of two hybrid bluegrasses (Thermal Blue and Dura Blue) was similar to that of two Kentucky bluegrasses (Apollo and Unique) and two tall fescue cultivars (Masterpiece and Rembrandt) when mowed at heights of 1, 2 and 3 inches (2.5, 5, and 7.5 centimeters) (7).

A greenhouse study revealed significant variability in drought resistance among 30 cultivars of hybrid bluegrasses and their genetic parents (two Kentucky bluegrasses and one Texas bluegrass accession), but the hybrid bluegrasses were not always more drought-resistant than the Kentucky bluegrasses (1). In a field experiment in Colorado, Reveille, a hybrid bluegrass, maintained turfgrass quality longer than a Kentucky bluegrass (Bensun [A-34]) during a prolonged soil dry-down (9). In the Colorado study, however, the hybrid bluegrasses showed poorer stand longevity than the Kentucky bluegrass, probably because the hybrids had limited tolerance to freezing stress.

Research objectives

The objectives of this two-year field study were to evaluate Kentucky bluegrass (Apollo), tall fescue (Dynasty) and two cultivars of hybrid bluegrasses (Thermal Blue and Dura Blue) for establishment rates after fall seeding; visual quality and growth characteristics of canopies; and drought resistance under different irrigation regimes and deficits in the transition zone.

Study site and experimental design

The study was conducted from September 2002 to October 2004 at the Rocky Ford Turfgrass Research Center near Manhattan, Kan. (Figure 1). The soil at the site was Chase silt loam.

Nine whole plots, 13 feet × 6.6 feet (4 meters × 2 meters), were each divided into four subplots, 6.6 feet × 3.3 feet (2 meters × 1 meter each), for a total of 36 subplots, established in a split-plot design. Two irrigation treatments and a control, replicated three times each, were applied to whole plots. Each irrigation-by-species/cultivar treatment combination was replicated three times in the entire study.

Subplots were seeded on Sept. 24, 2002, with four cultivars of turfgrasses: Dynasty tall fescue, Apollo Kentucky bluegrass, and Thermal Blue and Dura Blue hybrid bluegrasses. Seeding rates were 217.7 pounds/acre (244 kilograms/hectare) for tall fescue, 87.4 pounds/acre (98 kilograms/hectare) for Kentucky bluegrass, and 130.3 pounds/acre (146 kilograms/hectare) for Thermal Blue and Dura Blue.

Irrigation treatments included the replacement of 100% and 60% of the water lost from plants and soil via evapotranspiration. Control plots received only natural precipitation. Climatological data were obtained at a weather station located at Rocky Ford Turfgrass Research Center.

Plots received irrigation treatments only in 2004, because a moderate billbug infestation in 2003 affected a number of plots of Kentucky bluegrass, Thermal Blue and Dura Blue despite insecticide applications. To minimize stress related to billbug damage, in 2003 plots were irrigated every three to four days, providing 1.6 inches (40 millimeters) of water per week in the absence of rain.

Canopy evaluations and measurements

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

All plots were evaluated for visual turfgrass quality every two weeks from June 13 to Oct. 21, 2003, and from April 29 to Aug. 9, 2004. Turfgrass quality was rated on a scale of 1 to 9 (1 = dead, brown turf; 9 = optimal uniformity, density and color; and 6 = acceptable quality for a home lawn). Turfgrass density and color were also evaluated visually during the same periods in 2003 and 2004. These evaluations occurred less frequently and were independent of the quality evaluations.

Clippings were collected every three weeks, or four times from Aug. 5 to Oct. 10, 2003, with a walk-behind rotary mower

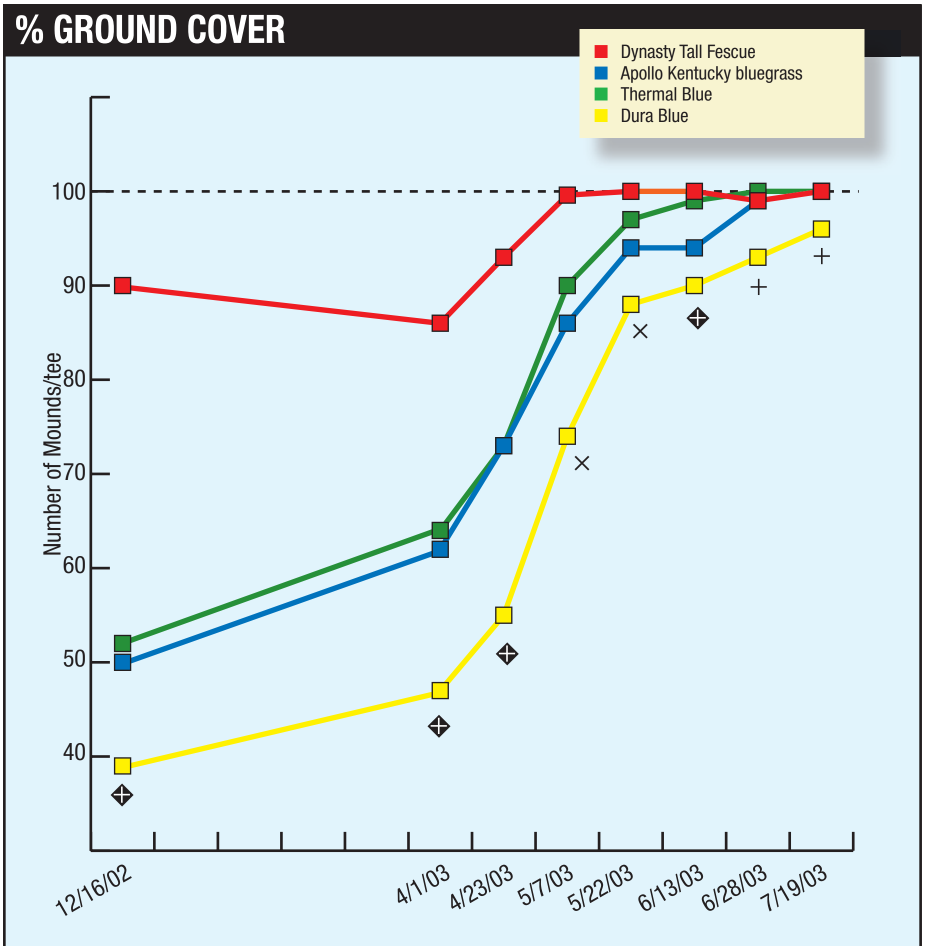

Figure 2. Visual estimates of percentage ground cover during plot establishment; plots were seeded on Sept. 24, 2002. A plus sign (+) below the data indicates significant differences between one and the other three species/cultivars; diamond-plus, significant differences among all species/cultivars except two; x, significant differences among all species/cultivars on a given day.

VISUAL QUALITY

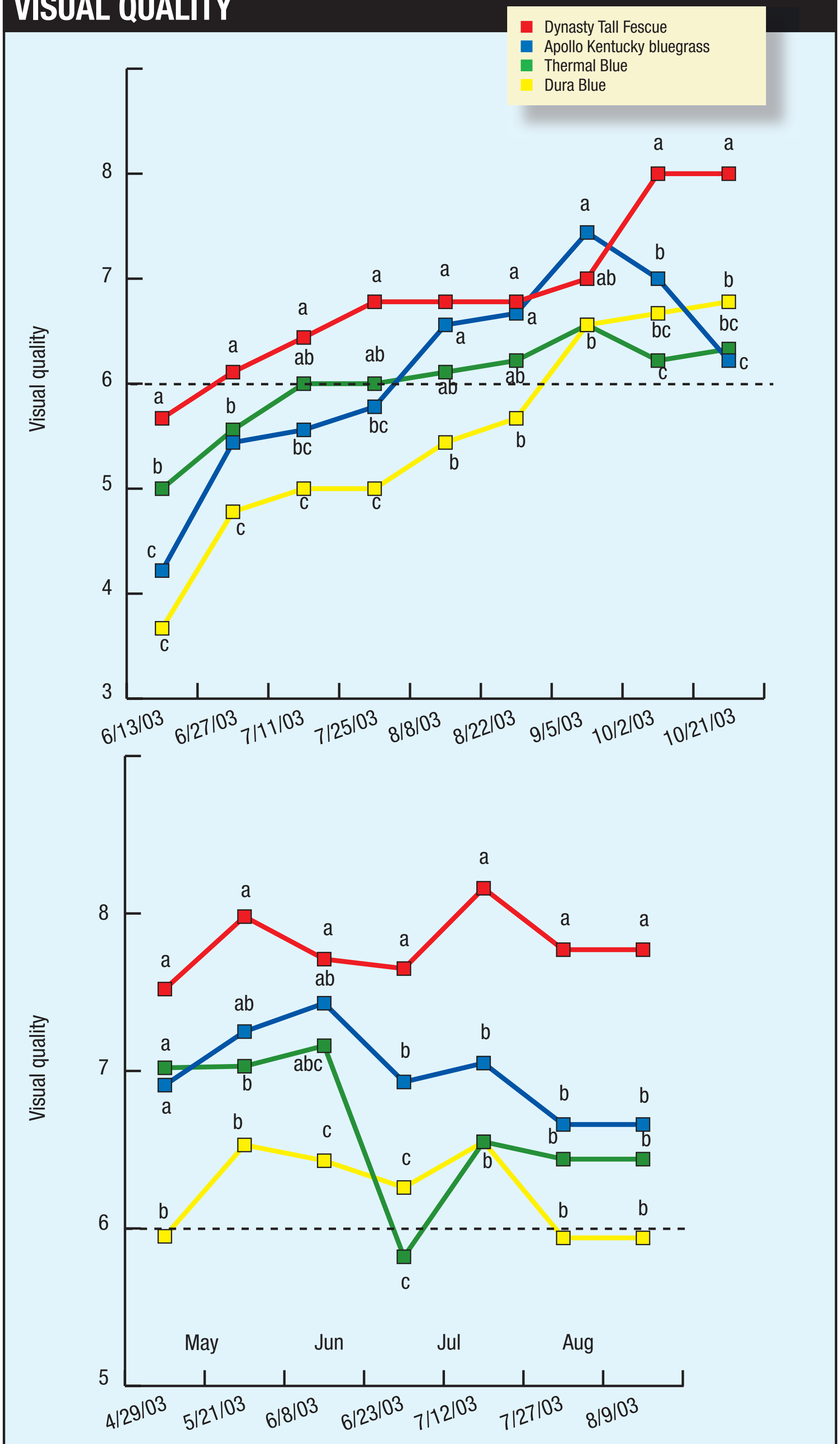

Figure 3. Visual quality ratings of Dynasty tall fescue, Apollo Kentucky bluegrass, Thermal Blue and Dura Blue in 2003. Turf was rated on a scale of 1-9 (1 = dead, brown turf; 9 = optimal uniformity, density and color). Dashed, horizontal line at 6 indicates acceptable quality for a home lawn. Means followed with the same letter within each respective day of year (vertical) are not significantly different.

equipped with a modified collection bag that allowed for complete capture of clippings from each plot. Clipped biomass samples were oven-dried for 48 hours at 149 F (65 C) and weighed.

Vertical growth rates were measured every two weeks or once a month from July 14 to Oct. 21, 2003, and every two weeks from June 14 to Aug. 12, 2004. Daily vertical growth rates were calculated as the increase in canopy heights between consecutive mowings, divided by the number of days between mowing.

Plot maintenance

All plots were mowed with a walk-behind rotary mower at a height of 2.5 inches (63.5 millimeters) once or twice weekly as needed. All plots were fertilized with urea nitrogen at approximately 200.7 pounds/acre (225 kilograms/hectare) per year 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 0.32 pound a.i./acre (0.36 kilogram a.i./hectare) of Merit (imidacloprid) on June 7 and 0.08 pound a.i./acre (0.09 kilogram a.i./hectare) of Talstar F (bifenthrin) on Aug. 1, and in 2004 with 0.39 pound a.i./acre (0.44 kilogram a.i./hectare) of Merit on April 19, 0.11 pound a.i./acre (0.125 kilogram a.i./hectare) of Talstar F on May 27, and 1.50 pounds a.i./acre (1.69 kilograms a.i./hectare) of Mach 2 (halofenozide) on July 9. Pre-emergence herbicide applications included 0.50 pound a.i./acre (0.56 kilogram a.i./hectare) of Dimension EC (dithiopyr) on May 17, 2003, and May 27, 2004. Broadleaf pests were treated as needed, and no fungicides were applied during the study.

Turfgrass establishment, quality and growth

Establishment rate

Establishment was most rapid in tall fescue, which was at 90% cover by Dec. 17, 2002, and reached 100% by May 7, 2003 (Figure 2). The Kentucky bluegrass and the hybrid bluegrasses established more slowly than tall fescue and at similar rates. Thermal Blue reached 99% cover by June 13 and Kentucky bluegrass by June 28. The Dura Blue was slowest to establish, reaching 96% cover by July 19.

Visual quality

Visual quality was generally lower in the bluegrasses (Kentucky bluegrass, Thermal Blue and Dura Blue) than in tall fescue during 2003 and 2004 (Figure 3). Mean quality, when averaged over the season, ranked tall fescue > Kentucky bluegrass > Thermal Blue > Dura Blue both years. 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 tall fescue and generally similar between Kentucky bluegrass and Thermal Blue in both years, but a lighter color in Thermal Blue resulted in its lower quality rating in a number of instances (data not shown). In 2003, quality in Dura Blue was consistently lower among plots early in the growing season because of its slower establishment (Figure 3A). Higher seeding rates may be required for Dura Blue to obtain an adequate stand.

Billbug damage

In 2003, billbug damage in the bluegrasses seemed greatest from about July 9 to 29, but keeping the plots well watered generally improved the quality of the bluegrasses (Figure 3A). Hybrid bluegrasses have been found to be susceptible to billbug (6), although a wide range of variability existed among hybrid bluegrass cultivars, and even individual plants within a single cultivar may be tolerant or susceptible. The decline of Kentucky bluegrass late in 2003 was caused by a rust disease that also affected, to a lesser extent, Thermal Blue and Dura Blue.

Clipping weight

Aboveground biomass production, as measured from clippings, was greater in tall fescue than in any of the bluegrasses in 2003 (Figure 4), reflecting the higher quality in tall fescue (Figure 3). Clipping weights in tall fescue were 42% higher than in Thermal Blue, 69% higher than in Kentucky bluegrass and 73% higher than in Dura Blue.

Vertical growth

Vertical growth rates of Thermal Blue were similar to those of tall fescue in 2003 and 2004, and were higher than Kentucky bluegrass and Dura Blue. Thermal Blue clearly shows little promise of reduced mowing frequency, compared with conventional cool-season species. The vertical growth

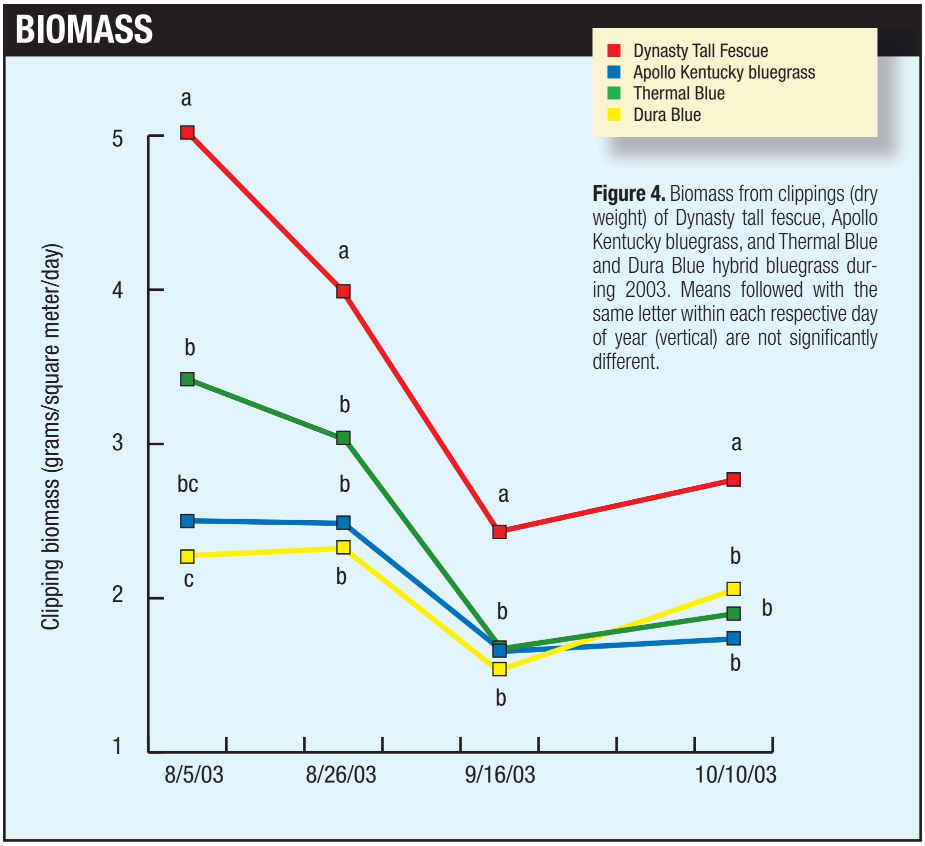

Figure 4. Biomass from clippings (dry weight) of Dynasty tall fescue, Apollo Kentucky bluegrass, and Thermal Blue and Dura Blue hybrid bluegrass during 2003. Means followed with the same letter within each respective day of year (vertical) are not significantly different.

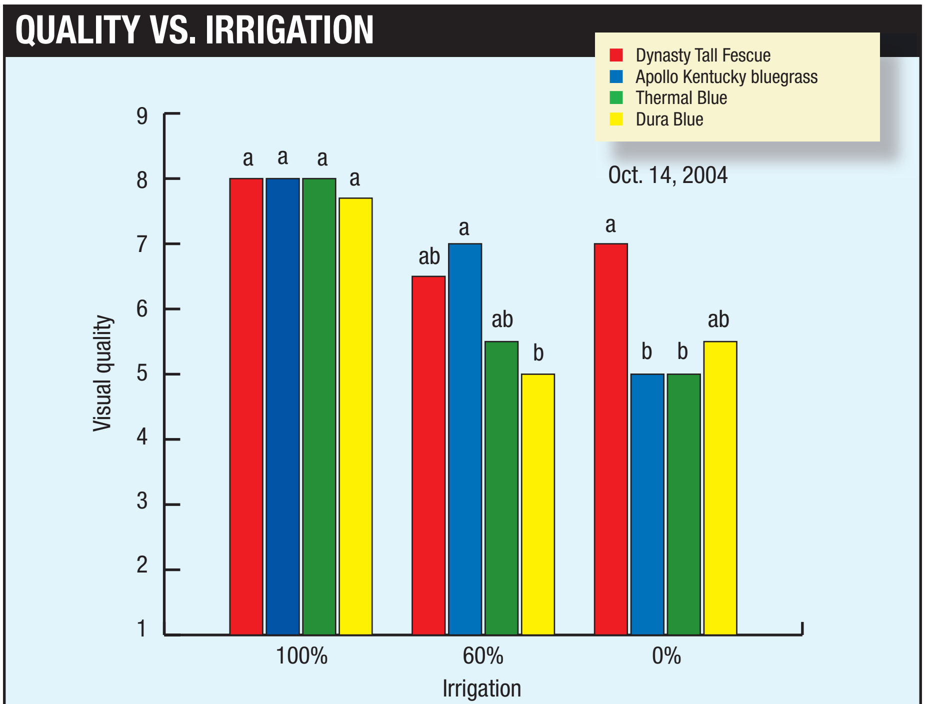

Figure 5. Comparisons of visual quality of Dynasty tall fescue, Apollo Kentucky bluegrass, and Thermal Blue and Dura Blue hybrid bluegrass within each irrigation treatment after a 52-day dry period (Aug. 24 - Oct 14, 2004). Turf was rated on a scale of 1-9 (1 = dead, brown turf; 9 = optimal uniformity, density and color; 6 = acceptable quality for a home lawn). Means with same letters within each irrigation group were not significantly different.

rate of Dura Blue, by contrast, was more like that of Kentucky bluegrass in both years. There is potential for reduced mowing frequencies with Dura Blue, and perhaps future hybrid bluegrass cultivars, compared with tall fescue.

Effects of water deficit

In 2004, frequent, above-average rainfall from May through August minimized the impact of water-deficit treatments.

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 (Figure 5). Visual quality in the 60% ET treatment was significantly lower in Dura Blue than in Kentucky bluegrass, and quality in Thermal Blue and Dura Blue was below the rating of 6 determined as acceptable for home lawns. In the control, which received only natural precipitation during this period (that is, no irrigation), the quality of all bluegrasses was below 6, and ratings of Apollo Kentucky bluegrass and Thermal Blue were significantly lower than those of Dynasty tall fescue. Visual quality in the tall fescue declined only from 8 to about 6.5 to 7 in the reduced irrigation and control plots, indicating that tall fescue was not substantially affected by drought in this study.

Tall fescue's lack of response to water deficit may have been caused by a combination of deep soils at the research site and the deep roots that are typical of tall fescue and may extract water from lower in the profile (3,4).

Conclusions

Our results indicate that tall fescue may be better suited than hybrid bluegrasses in areas of the transition zone where soils are deep, especially if drought resistance is a priority. Susceptibility of hybrid bluegrasses to bluegrass billbug in this study also suggests that maintenance costs in hybrid bluegrasses may be higher than in tall fescue, although other cultivars of hybrid bluegrasses not tested in this study may be more resistant to billbug damage (5). Because some cultivars of hybrid bluegrasses also may exhibit higher drought resistance than others (1), further research is needed on new or different cultivars of hybrid bluegrasses and in areas with different soils to more completely determine the potential for the use of hybrid bluegrasses in the transition zone.

THE RESEARCH says . . .

- **Two hybrid bluegrass** cultivars (Thermal Blue and Dura Blue), one Kentucky bluegrass cultivar (Apollo) and one tall fescue cultivar (Dynasty) were evaluated for establishment rates after seeding, visual quality and growth characteristics, and drought resistance in northeastern Kansas.
- **Tall fescue reached** full cover 37-73+ days before the other grasses in the study.
- **In both years,** average quality over the growing season was ranked: tall fescue > Kentucky bluegrass > Thermal Blue > Dura Blue.
- **Canopy density was** lower in Dura Blue and higher in tall fescue among treatments. Clipping biomass of tall fescue was 42% to 73% higher than that of the bluegrasses.
- **Drought generally reduced** quality among bluegrasses, but effects on tall fescue were negligible.
- **Results indicate that** tall fescue is better adapted than hybrid bluegrasses where soils are deep in the transition zone. Further research is needed using new cultivars of hybrid bluegrasses and in areas with different soils.

Funding

This research was funded by The Environmental Institute for Golf, The Scotts Co., the Kansas Turfgrass Foundation and the Kansas Agricultural Experiment Station.

Acknowledgments

The technical assistance of Alan Zuk and Angela Kopriva was appreciated. This is Contribution No. 06-260-J from the Kansas Agricultural Experiment Station. This article was originally published in the online journal *Applied Turfgrass Science* as "Performance in the transition zone of two hybrid bluegrasses compared with Kentucky bluegrass and tall fescue" by D.J. Bremer, K. Su, S.J. Keeley and J.D. Fry. doi:10.1094/ATS-2006-0808-02-RS. www.plantmanagementnetwork.org/sub/ats/research/2006/hybrid/.

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