

Comparative Irrigation Requirements of 30 Cultivars of Kentucky Bluegrass under a Large Rainout Facility in the Transition Zone

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Objectives:

1. Develop a novel method for concurrently comparing irrigation requirements among 30 cultivars of turfgrasses using a large rainout facility at Kansas State University.
2. Produce a database of relative irrigation requirements for 30 cultivars of Kentucky bluegrass.
3. Partition cultivars of Kentucky bluegrasses into irrigation-requirement categories of "high, medium, and low."
4. Conduct dry-down and genetic rooting potential experiments in a greenhouse to evaluate responses to drought and physiological characteristics among the same cultivars as those tested in the field.

Start Date: 2006

Project Duration: two years

Total Funding: \$47,058

Efficient use of irrigation water on turf is becoming more crucial in the U.S. Information is needed about relative irrigation rates among newly-released cultivars of turfgrasses. A large rainout shelter near Manhattan, Kansas offers an opportunity to compare the irrigation requirements of multiple turfgrass cultivars in the stressful climate of the transition zone. By shielding rainfall from the turfgrasses, plots can be irrigated individually on an as-needed basis over a period of several weeks or months to determine the total irrigation requirements among cultivars given similar field conditions. Turfgrasses with similar visual qualities but with lower irrigation requirements may offer significant water savings to turfgrass managers.

Twenty-eight cultivars of Kentucky bluegrasses and two Texas bluegrass hybrids were selected for this study from among and within 11 different phenotypic groups, based largely on performances in the 2004 NTEP tests. Plots, replicated three times per cultivar, were prepared and seeded under the rainout shelter in September 2006. Plot preparation included cultivation, fumigation, leveling, and insertion of 30-cm deep metal edging around individual plots to prevent lateral movement of water.

There were two summer dry-down periods. Plots were well-watered until early June 2007 and 2009, after which turfgrasses were allowed to dry down without irrigation or precipitation until the first sign of wilt. Individual cultivars were evaluated daily and irrigated with one inch of water when approximately 50% of the plot area showed visible symptoms of wilt. Each plot was manually irrigated, and irri-



Well-watered plots at beginning of study (June 4), prior to initiating drydown experiments (A) and plots at two months into the study (Aug. 4; B). Drought stress is evident in some plots of Kentucky bluegrass.

gation quantity and date was recorded. General turf performance was also evaluated daily by visually rating turf quality.

The total amount of water applied averaged over the two summers varied significantly among cultivars and ranged from 8 to 20 inches during the four-month period. Visual quality also varied substantially among cultivars. In general, when considering both visual quality and water requirements, cultivars in the Compact America and Mid-Atlantic groups performed better (higher quality, lesser water requirements) and "Common" types poorer (lower quality, greater water requirements) among phenotypic groups, although there was significant variability even among cultivars within each group.

The same cultivars used in the field study were evaluated for rooting

characteristics including maximum root length extension, surface area, mean root diameter, and root biomass in a greenhouse at Kansas State University using root tubes. Briefly, turfgrasses were planted into clear polyethylene root tubes that were filled with fritted clay; polyethylene tubes were then inserted into opaque PVC pipe (sleeves).

Root growth was monitored periodically along the side of the clear root tubes. There were broad ranges in rooting characteristics among cultivars at each depth. A number of cultivars had maximum rooting depths below 90 cm. Differences among phenotypic groups were less pronounced although root surface area was lower in Mid-Atlantic and Compact America groups than in "Common" types.

Summary Points

- Twenty-eight cultivars of Kentucky bluegrasses and two Texas bluegrass hybrids were established under a large rainout shelter located in the transition zone.
- Individual cultivars were evaluated in the field from June through September, 2007 and 2009 for their visual quality and total water requirements during repeated dry-downs.
- Cultivars in the Compact America and Mid-Atlantic groups generally performed better (higher quality, lesser water requirements) and "Common" types poorer (lower quality, greater water requirements) among phenotypic groups although there was significant variability even among cultivars within each group.
- There was a broad range in the rooting characteristics among cultivars.
- Greenhouse rooting characteristics measured were not correlated with water applied in the field study.