A pivot irrigation system creates a range of moisture conditions on each plot and has wheels that simulate golf carts making sharp turns on the turf.

IRRIGATION AND ROOTZONE DEPTH EFFECTS ON DROUGHT RESISTANCE OF FAIRWAYS

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- Field research studying deficit irrigation on warm-season fairways shows differences in drought resistance and irrigation water requirements among the cultivars.
- Shallow rootzone depths may increase the irrigation water requirements differently for each cultivar.
- A final design for a variable irrigation system that also simulates golf cart traffic was developed.

The cost and availability of irrigation water for turfgrass maintenance is a concern for golf courses everywhere. In some cases, a reduction in irrigated acreage is utilized for immediate water savings. Another approach is to reduce the quantity of water applied to the golf course without changing the maintained turfgrass area. On average, according to a recent USGA-funded survey of U.S. golf courses, fairway acreage comprises 29% of the maintained turfgrass on a golf course. Utilizing more-efficient fairway irrigation programs and grasses that are more drought tolerant could result in meaningful water savings without reducing the maintained turf area. Scientists at Oklahoma State University are measuring how turfgrass cultivar performance is influenced by plant water use rates, evapotranspiration (ET), soil moisture content, rootzone depth and traffic. The specific objectives are to 1) quantify water use of key turfgrasses as affected by deficit irrigation practices, 2) evaluate how drought resistance of key turfgrasses is affected by rootzone depth, and 3) assess the effects of traffic on turfgrasses under drought stress caused by deficit irrigation programs.

A field experiment in Stillwater, Oklahoma, measured water use rates as affected by cultivar and deficit irrigation program. In June 2017, seven fairway bermudagrasses and one fairway zoysiagrass ('U-3', 'Celebration', 'Tifway', 'Latitude 36', 'TifTuf', 'PremierePro', 'OSU 1403' and 'Meyer') were established in plots. Plots were mowed three times a week at a cutting height of 0.5 inch during the growing season. During summer 2018, each cultivar plot was split into four irrigation levels: 25%, 50%, 75% and 100% of reference ET, where the crop coefficient was 0.7 – i.e., 70% of the reference ET. Based on reference ET from a nearby weather station, irrigation was hand-applied once per week for the four replacement levels. Eight- and 12-inch-deep lysimeters were used within each plot to assess how cultivar performance varies under different rootzone depths. Measurements of turf performance were conducted weekly using turf quality ratings and the normalized difference vegetation index (NDVI). Volumetric water content was measured at 3-, 4-, 8-, 12- and 16-inch depths twice per week. Differences in moisture content between measurement dates were used to estimate ET rates over the course of a typical irrigation interval.

Significant differences in drought resistance were apparent during late July. Specifically, 'Meyer' zoysiagrass and 'OSU 1403' bermudagrass each showed drought stress at the 25% ET levels, while other cultivars showed no indication of stress at these levels under unrestricted rooting. When rootzones were restricted, drought stress was more severe, but again most visible for 'Meyer' and 'OSU 1403'. These early results suggest drought resistance in the other cultivars may include either dehydration tolerance or lower water use rates. In 2019, an additional year of data will be collected from both experiments.

In summer 2018, a second experiment was established to evaluate the effects of traffic on irrigation water requirements of seven common fairway bermudagrasses and one fairway zoysiagrass ('TifTuf', 'U-3', 'Latitude 36', 'Celebration', 'Tifway', 'OKC 1403', 'OKC 1221' and 'Meyer'). The plots are unique in that they were planted as pie-shaped wedges around a central point. A small center-pivot irrigation system creates a radial gradient of water delivery moving from wet near the center to dry at the outer edge. The pivoting arm also has wheels that simulate golf cart traffic associated with carts making sharp turns. Irrigation and traffic treatments for the radial-gradient irrigation system are currently being evaluated and will be repeated in summer 2020.

Source: Charles Fontanier and Justin Moss, Oklahoma State University

Additional Information:

ET-Based Irrigation Scheduling

Water Management Tools

Case Studies in Water Use Reduction from California

Effects of Deficit Irrigation and Rootzone Depth on Water Use and Drought Resistance of Warm-Season Fairways

Deficit Irrigation of Bermudagrass to Conserve Water While Maintaining Plant Health

Enhancing Site-Specific Turf Irrigation Management and Developing Turf Deficit Irrigation Strategies Using Soil Moisture Sensors, Smart ET-Based Irrigation Controllers, and Remote Sensing

