

Evaluation of Putting Green Bermudagrasses for Shade Tolerance and Evaluation of Fairway Bermudagrasses for Water Use Rates

Justin Moss
Oklahoma State University

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Objectives:

1. Evaluate experimental and commercialized putting green bermudagrasses under shaded field conditions.
2. Evaluate and measure for differences in water use rates among several industry standard bermudagrass cultivars and OSU experimental bermudagrasses under non-limiting water conditions.

Shade is a limiting factor in many areas when considering putting greens species conversion from creeping bentgrass (*Agrostis stolonifera*) to bermudagrass (*Cynodon* spp.) in the U.S. transition zone. Several OSU experimental bermudagrass varieties exhibit improved winter tolerance and persistence equal to or exceeding commercially available standard, dwarf and ultra-dwarf putting green types at Stillwater, OK. While winter tolerance is an important factor for putting green bermudagrasses in the transition zone, shade tolerance evaluation of these selections is also needed to determine if they can offer real advantages over existing commercialized bermudagrasses on a putting surface in the U.S. transition zone.

Water conservation is important for golf courses across the southern United States. Bermudagrass is widely used in the U.S. transition zone and is generally considered a drought resistant grass, but differences in water use rates likely exist among cultivars. Water use rate is defined as the total amount of water required for turfgrass growth plus the quantity lost by transpiration from the plant and evaporation from the soil surface. The water use rate (WUR) is also synonymous with the term “evapotranspiration” (ET). Identification of bermudagrasses with excellent turfgrass quality and low water use rates is critical for responsible water use in the game of golf.



Bermudagrass putting green shade trial grow-in.

Putting Green Shade Tolerance Evaluation: A three year shade tolerance evaluation field trial is being conducted at Stillwater, OK to measure the response of the four OSU experimental bermudagrasses to three standard bermudagrass putting green cultivars (TifEagle, MiniVerde, and Champion Dwarf) and ‘Diamond’ zoysiagrass maintained at putting green height. The trial was planted from sprigs on a sand based putting green in July 2013. The putting green area is blocked to provide six replications of each cultivar under natural tree

Table 1. Performance of bermudagrass putting green cultivars and experimental selections under natural tree shade conditions in Stillwater, OK in 2014.

Entry	Jun			Jul			Aug			Sep		
	TQ ¹	NDVI ²	Cover ³	TQ	NDVI	Cover	TQ	NDVI	Cover	TQ	NDVI	Cover
TifEagle	5.8a ⁴	0.62a	77.4a	6.3a	0.70ab	93.9a	7.2a	0.80a	98.0a	7.7a	0.80ab	99.3ab
Champion Dwarf	5.0b	0.62a	78.5a	5.8a	0.71ab	96.5a	6.2bc	0.79a	97.3a	7.5a	0.82a	99.1ab
MiniVerde	4.7b	0.63a	74.8a	6.0a	0.73a	94.1a	6.8ab	0.78a	95.5a	7.3a	0.78abc	97.1abc
MS264	5.0b	0.58a	74.1a	5.7a	0.67b	85.2b	6.3b	0.75ab	98.7a	7.0a	0.77bc	99.8a
Diamond ⁵	4.5bc	0.47b	69.2a	4.7b	0.54cd	74.5c	5.5cd	0.68c	92.1ab	5.7b	0.67d	91.5bc
OSU16-13-8	3.7d	0.49b	58.9b	4.0bc	0.55cd	65.2d	5.0d	0.73b	83.4cd	5.7b	0.69d	90.2c
OSU13-78-5	3.8cd	0.50b	58.4b	4.3b	0.59c	69.7cd	5.2d	0.72bc	88.9bc	5.7b	0.75c	95.4abc
OSU1-75-2	3.5d	0.44b	58.0b	3.5c	0.52d	58.4e	4.2e	0.62d	78.4d	4.7c	0.61e	78.7d

¹Turf quality (TQ) was measured using National Turfgrass Evaluation Program procedures where 1 = poor turf quality, 6 = acceptable, and 9 = excellent turf quality.

²Normalized vegetative difference index (NDVI) was measured with a GreenSeeker handheld sensor.

³Percent vegetative cover (Cover) was measured using SigmScan digital image analysis software.

⁴Mean separation was performed using Fisher's protected least significant difference test. Means within columns with different letters are significantly different at the 95% confidence level.

⁵'Diamond' zoysiagrass was used as a standard entry.

(*Platanus occidentalis*) shade. Photosynthetic active radiation was monitored daily throughout the plot area. The putting green was mowed at 0.155 inches during the growing season and raised to 0.175 during the fall/winter. The plot was covered during winter 2013/2014 to protect against low temperature injury. Trinexapac-ethyl was applied as a standard treatment to all plots during the growing season. Percent bermudagrass coverage (after establishment) was measured monthly using digital image analysis, monthly NDVI (normalized difference vegetative index) was collected using a GreenSeeker NDVI sensor (NTech Industries, Inc., Ukiah, CA), and turfgrass quality was recorded monthly using NTEP data collection methodology. Data was collected in 2014 and will continue through 2016.

Putting Green Shade Tolerance Results:

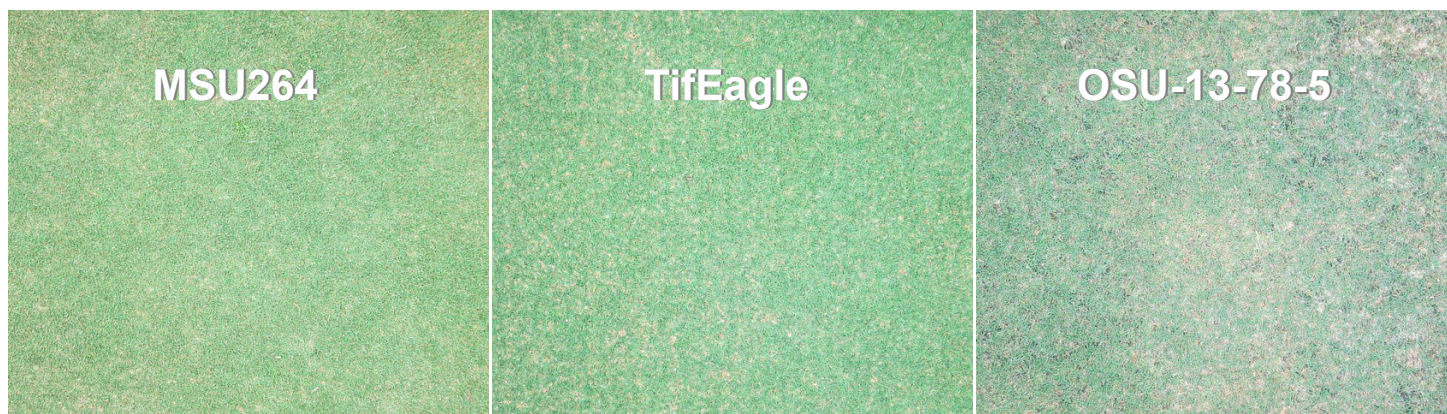
Throughout 2014, TifEagle was ranked in the top least significant difference group (LSD) for all parameters on all rating dates (Table 1). Also, Champion Dwarf and MiniVerde were ranked in the top LSD group for NDVI and

Cover on all rating dates. The shade tolerant standard entry, Diamond zoysiagrass, was ranked lower than TifEagle, Champion Dwarf, and MiniVerde NDVI on all rating dates. The experimental entry MS264 was ranked in the first or second LSD group for NDVI and percent coverage on all rating dates. The experimental entry OSU1-75-2 was consistently a low performer for all parameters throughout 2014.

Bermudagrass Water Use Rates:

This research is being conducted at the Oklahoma State University Turfgrass Research Center in Stillwater, OK. A field plot with the bermudagrass cultivars and associated lysimeters with three replications was constructed in 2013. The bermudagrass entries were: Celebration, Tifway, Premier, U-3, Latitude 36, NorthBridge, and experimental entries DT-1, OKC-13-02, OKC-11-31, and OKC-11-63. Water use (ET) was estimated by the change in mass of the lysimeter measured at 0, 24, and 48 hours after achieving field capacity. All weights were collected pre-dawn while plant

The commercially available putting green bermudagrass cultivars TifEagle, Champion Dwarf, and MiniVerde had good performance under natural tree shade field conditions in 2014 while OSU-13-78-5 performed poorly.



stomata were presumed to be closed to avoid any potential error from collecting measurements from actively transpiring plants. The ET measurements were collected from May through September 2014 and will be repeated in upcoming years.

Bermudagrass Water Use Rates Results:

Lysimeter data is currently being collected through the 2014 growing season and results are being analyzed. Data was collected in May – October 2014, but complete results are not available at the time of writing the 2014 USGA summary report. In general, there are significant differences in water use rates among the entries and results will be presented and discussed in 2015 and beyond.

Summary Points

- The commercially available putting green bermudagrass cultivars TifEagle, Champion Dwarf, and MiniVerde had good performance under natural tree shade field conditions in 2014 in Stillwater, OK.
- The experimental putting green entry MS264 was a good overall performer under natural tree shade field conditions while the OSU experimental entries were poor overall performers during 2014 in Stillwater, OK.
- There were significant water use rate differences among bermudagrass cultivars and experimental entries under non-limiting soil water conditions in Stillwater, OK in 2014.