

**Progress Report:** December 2, 2016

**Project Title:** Evaluation of Putting Green Bermudagrass for Shade Tolerance and Evaluation of Fairway Bermudagrasses for Water Use Rates

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Start Date: 2014

**Number of Years:** 3

**Total Funding:** \$60,000

**Project #1:** Evaluation of Putting Green Bermudagrass for Shade Tolerance

**Objectives:**

- *Evaluate experimental and commercialized putting green bermudagrasses against Diamond zoysiagrass under full sun and shaded conditions.*

**Research Progress:**

- Plots were planted from sprigs on a sand based putting green in July 2013 and fully established in 2014.

**Preliminary Results:**

- TifEagle, 264, MiniVerde, and Champion performed best in 2014 while Diamond, MiniVerde, TifEagle, and Champion were the best cultivars in 2015.
- 16-13-8 and 1-75-2 were consistently ranked lowest in 2014 and 2015.
- Diamond zoysiagrass exceptionally performed well in 2015 compared to all bermudagrass cultivars.

A research site was planted using greenhouse-grown grass sprigs on June 7, 2013. A row of fully mature *Platanus occidentalis* runs parallel to the east side of the study area and provides natural, tree shade in the morning and early afternoon, depending on season. The site was blocked to provide six replications of each cultivar. Photosynthetically active radiation was collected throughout the study period. The plots were covered with a geo-textile to protect against low temperature injury.



The standard entries, 'Champion', 'Mini Verde', 'TifEagle' Bermudagrass, and 'Diamond' Zoysiagrass and experimental entries were planted on 5 x 5 ft. plots. Plots were mowed 6 times per week at a 0.155 height and nitrogen was applied at 49 kg/ha monthly. Irrigation was applied at rates and frequencies necessary to maintain acceptable green turf. Trinexapac-ethyl was applied as a standard treatment to all plots during the growing season.

Turfgrass visual quality was assessed monthly based on 1-9 scale. In addition, Normalized difference vegetative index (NDVI) was collected monthly using a GreenSeeker sensor to assess shade stress through changes in turfgrass color and cover.

In 2014, TifEagle, 264, MiniVerde, and Champion significantly performed better than Diamond zoysiagrass (Table 1). Experimental entries, 13-78-5, 16-13-8, and 1-75-2 including Diamond zoysiagrass showed unacceptable TQ in 2014. In 2015, all bermudagrass cultivars poorly performed compared to Diamond zoysiagrass. In 2016, Diamond zoysiagrass and Champion bermudagrass were not statistically different, but Diamond was significantly better than the other commercial standards for bermudagrass. However, the area covered by Diamond zoysiagrass has been reduced through competition in plot perimeters. All experimental lines were ranked lower than industrial standards, MiniVerde, TifEagle, and Champion.

Table 1. The turf visual quality means of bermudagrass collected monthly in 2014, 2015 and 2016.

2014			2015			2016		
Cultivar	TQ	NDVI**	Cultivar	TQ	NDVI	Cultivar	TQ	NDVI
TifEagle	6.6 a*	0.739	Diamond	7.0 a	0.679	Diamond	7.4 a	0.697
264	6.1 a	0.708	MiniVerde	5.8 b	0.611	Champion	6.8 ab	0.688
MiniVerde	6.1 a	0.737	TifEagle	5.4 bc	0.630	MiniVerde	6.7 b	0.669
Champion	6.0 a	0.743	Champion	5.0 c	0.607	TifEagle	6.7 b	0.681
13-78-5	4.8 b	0.656	13-78-5	4.7 cd	0.599	264	5.7 c	0.659
Diamond	4.8 b	0.596	264	4.6 cd	0.590	13-78-5	3.6 d	0.631
16-13-8	4.3 bc	0.617	16-13-8	4.1 d	0.570	16-13-8	3.3 de	0.595
1-75-2	3.9 c	0.563	1-75-2	2.9 e	0.493	1-75-2	2.8 e	0.554

\* Treatments within column with same letters are not significantly different at  $p=0.05$ .

\*\*Normalized difference vegetation index (near infrared reflectance - red reflectance) / (near infrared reflectance + red reflectance)

For irradiance data, PAR sensors were equally spaced in distance from one another creating a light gradient as the sensors increased in proximity to the tree line. The significance of the difference can most easily be noted in summer months as defoliation in winter months significantly increases the relative amount of light to the highest shade treatment (Table 2).

Table 2. Photosynthetically Active Radiation (PAR) average measurements reported for February, July, and November of 2016 by sensor location in  $\mu\text{M}/\text{m}^2\text{s}/\text{day}$ .

Month-Year	Average Daily PAR by Sensor Location ( $\mu\text{M}/\text{m}^2\text{s}$ )		
	East	Center	West
Feb-16	13044.2	7313.5	7898.9
Jul-16	13342.7	18419.2	21500.6
Nov-16	6266.7	7533.5	10010.4

## Project #2: Evaluation of Fairway Bermudagrasses for Water Use Rates

**Objectives:** Evaluate, measure, and explain any differences in water use rates among several industry standard bermudagrass cultivars vs OSU experimental bermudagrasses.

### Research Progress:

- Lysimeters were maintained in the greenhouse from December to April each year to prevent winter injury.

### Preliminary Results:

- ET rates in 2014 ranged from  $4.93 \text{ mm d}^{-1}$  to  $6.19 \text{ mm d}^{-1}$  and ranged from  $3.88 \text{ mm d}^{-1}$  to  $6.03 \text{ mm d}^{-1}$  in 2015.

- DT-1 was the most water use cultivar in 2014 and 2015 with ET of 6.19 mm d<sup>-1</sup> and 6.03 mm d<sup>-1</sup>, respectively.
- OKC 1163 and OKC 1131 were the low water use cultivars in both 2014 and 2015, respectively.

The research site was a former 2002-2006 NTEP (National Turfgrass Evaluation Program) bermudagrass trial with 2.4 x 2.4 m plots. Six genotypes out of ten were new which were not included in the original NTEP trial. These were 'Latitude 36', 'NorthBridge', DT-1, OKC 1302, OKC 1131, and OKC 1163. The new genotypes were planted in the plots by removing the former grass using sod cutter in May, 2013.

The lysimeters were constructed using polyvinyl chloride (PVC) tube, 15.2 cm inside diameter and 35.6 cm long with a root zone depth of 30.48 cm and an extra 5.1 cm of length below the root zone to accommodate a drain valve on the bottom (Photo 1). A threaded ball valve was installed onto the bottom inside of each lysimeter. The inner side of the lysimeter was filled with a geo-textile porous sheet to prevent any loss of the rooting medium. The rooting medium is a calcined clay product.

Field ET rate was collected from May to September in 2014 and August to September in 2015 (Photo 3).

OKC 1131, NorthBridge, and OKC 1163 were the low water use cultivars in both 2014 and 2015 whereas DT-1 was the higher water use cultivar (Table 2). 'Celebration' and 'Tifway' were ranked as the second most water use group in 2014 and 2015. OKC 1302 was one of the higher water use cultivars in 2014, but it was among the lower water use cultivars in 2015.

Table 2. Mean daily ET rate (mm d<sup>-1</sup>) of ten bermudagrass entries under non-limiting soil moisture conditions in 2014 and 2015.

2014		2015	
Entries	ET*	Entries	ET
DT-1	6.19 a**	DT-1	6.03 a
Celebration	6.08 ab	Tifway	5.36 ab
OKC 1302	6.07 ab	Celebration	5.19 ab
Tifway	6.00 b	Premier	5.15 ab
Premier	5.71 c	Latitude36	5.10 b
Latitude 36	5.70 c	TGS_U3	4.99 bc
TGS_U3	5.51 d	OKC1302	4.59 bcd
OKC 1131	5.18 e	NorthBridge	4.19 cd
NorthBridge	5.17 e	OKC1163	4.01 d
OKC 1163	4.93 f	OKC1131	3.88 e

\* Water use in mm d<sup>-1</sup>. Values are the mean of 14 ET rates and 6 ET rates in 2014 and 2015, respectively.

\*\* Treatments within column with same letters are not significantly different at  $p=0.05$ .



Photo 1. A row of fully mature *Platanus occidentalis* on the east side of the study area.



Photo 2. A lysimeter in a field plot.



Photo 3. ET rate collection from filed plots.

