

## Development of Shade-Tolerant Bermudagrass Cultivars for Fine Turf Use

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**Start Date:** 2014

**Project Duration:** three years

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

### Objectives:

1. Cross bermudagrass selections screened for shade tolerance and fine turf qualities.
2. Establish progeny from seed and evaluate the progeny for shade tolerance, seed yield, and fine turf qualities.
3. Develop a shade-tolerant seeded bermudagrass cultivar(s).

Bermudagrass (*Cynodon* spp.) is the most popular warm-season turfgrass used on golf courses in the US. However, most currently available bermudagrass cultivars don't have sufficient shade tolerance. Since 2007, with financial support from the USGA, 45 common bermudagrass [*C. dactylon* (L.) Pers.] germplasm accessions assembled at the Oklahoma State University turfgrass breeding program with seed-producing potential were tested and selected for shade tolerance. Using the best germplasm accessions, two synthetics, OKS 2011-1 and OKS 2011-4 were created. In the summer of 2013, the two new synthetics along with 'Celebration', 'Latitude 36', 'NorthBridge', 'Patriot', 'Princess 77', 'Riviera', 'TifGrand', and 'Yukon' were planted in 0.91 m x 1.52 m (3 ft. x 5 ft) plots with four replications on each of three sites, one severe shade site, one partial shade site, and one full sun site. The three sites are adjacent each other and located on the OSU Turf Research Center. Plots were mowed 3 times per week at 5 cm height and nitrogen was applied at 5 g/m<sup>2</sup> (1 lb. /1000 ft<sup>2</sup>) monthly. Irrigation was applied at rates and frequencies necessary to prevent drought stress.

In 2015, 67% of photosynthetic photon flux (PPF) was reduced in shade plots as compared to the full sun site. It was 23% more shade than the previous two years due to the adjustment of the shade cloth more toward to the center of the shade block. Shade plots received full sun light between ~ 9:30 to 10 am. Increase in shade duration decreased turf quality to 36% in 2015 from 26 % in 2014 and NDVI 26% from 7.7%. Celebration and NorthBridge were the top ranked bermudagrasses in shade plots (Table 1). However, the best six cultivars and worst four cultivars in shade remained same as year 2014. OKS 2011-1 was not significantly different from Riviera and Yukon. Among seeded type bermudagrasses, OKS 2011-1 was visually ranked the same as Riviera, Yukon, and OKC 2011-4 in shade. Patriot and TifGrand were the most poorly performed cultivars both in shade and full sun. On April 30, 2015, 98 best plants from 2011-3 nursery plots in severe shade (Photo 1) were collected for further development. OKS 2011-1 and 2011-4 were among the top ranked cultivars for spring green up both in shade and full sun.

Table 1. The visual turf quality (TQ) means of bermudagrass collected on nine rating dates from 15 May to 16 Oct 2015.

Bermudagrass	Shade			Sun			Shade/sun Decline***
	TQ	Visual Rank*	NDVI**	TQ	Visual Rank	NDVI	
	1-9=best	---- LSD ----		1-9=best	---- LSD ----		
Celebration	5.3	A	0.6275	6.9	DE	0.8000	-21.56
NorthBridge	5.1	AB	0.6325	7.6	A	0.8075	-21.67
Riviera	4.8	BC	0.5750	7.4	BC	0.8175	-29.66
Yukon	4.7	BCD	0.6050	7.5	AB	0.8075	-25.08
Latitude36	4.7	BCD	0.6125	7.5	AB	0.8225	-25.53
2011-1	4.5	CDE	0.6250	7.1	CD	0.8050	-22.36
Princess77	4.4	CDE	0.6525	6.7	F	0.8000	-18.44
2011-4	4.3	DE	0.5625	7.0	D	0.8050	-30.12
TifGrand	4.2	E	0.5350	6.5	F	0.8150	-34.36
Patriot	3.6	F	0.5325	6.7	F	0.7950	-33.02
LSD	0.4		0.0557	0.24		0.019	

\*Based on Fisher's protected least significant difference ( $P=0.05$ ); means followed by the same letter do not differ significantly. \*\*Normalized difference vegetation index (near infrared reflectance - red reflectance) / (near infrared reflectance + red reflectance).

\*\*\*NDVI in shade compared with NDVI in full sun reported in %; (shade - full sun)/full sun\*100

Table 2. The spring greenup ratings on April 9, 2015.

Bermudagrass	Shade		Sun	
	Visual rating	Visual Rank*	Visual rating	Visual Rank
	1-9=best	---- LSD ----	1-9=best	---- LSD ----
Riviera	6.0	A	7.0	A
2011-1	5.5	AB	6.8	AB
NorthBridge	5.5	AB	6.0	BC
2011-4	5.5	AB	7.0	A
Yukon	5.5	AB	7.0	A
Latitude36	4.8	BC	5.8	C
Celebration	4.3	CD	4.3	D
TifGrand	3.8	DE	3.0	EF
Princess77	3.3	E	2.3	F
Patriot	3.0	E	3.3	E
LSD	0.8		0.9	

\*Based on Fisher's protected least significant difference ( $P=0.05$ ); means followed by the same letter do not differ significantly

## Summary Points

- The overall turf quality of bermudagrass entries in shade compared with that in full sun declined from 27% in 2014 to 36% in 2015. The NDVI decline also deepened from 7.7% in 2014 to 26% in 2015 after moving 75% black woven shade clothes to the center of the plots in 2015.
- Best 98 plants were selected in a segregation population from the 2011-3 nursery plots under severe shade.
- OKS 2011-1 bermudagrass was equally ranked to Yukon, Riviera, Princess77 and OKS 2011-4 and better than Patriot in shade.

Photo 1. Best survival plants selected in the 2011-3 bermudagrass population grown in severe shade.

