

## Introduction

A multi-state effort is underway to develop new cultivars of warm-season turfgrass that have improved drought, salinity and/or shade resistance. This USDA-NIFA funded project is a cooperative effort of the turfgrass development programs at the Univ of FL, NC State Univ, the Univ of GA, TX A&M Univ and OK State Univ. In addition to improved resistance or tolerance to abiotic and biotic stresses, new turfgrass cultivars that will be vegetatively propagated must also have suitable sod production cycles, handling quality and tensile strength to be embraced by the sod production industry. This poster presents a small portion of the work currently underway on advanced lines of bermudagrass that were previously developed and advanced within the multi-state project. This presentation focuses on the determination of the sod handling quality and sod tensile strength of 40 advanced bermudagrass lines and four industry standards. The experimental lines under test in this work had previously been found to have improved drought resistance under field conditions.

## Objectives

- To assess the sod handling quality (SHQ) and sod tensile strength (STS) of 40 promising experimental bermudagrass lines against the successful commercial standards of 'Celebration<sup>®</sup>', 'TifTuf<sup>™</sup>', 'Latitude 36' and 'Tifway' bermudagrass.

## Materials and Methods

- Research conducted at the Oklahoma State University - Botanic Garden & Turfgrass Research Facility. Located 1.6 km west of Stillwater, OK (Figures 1 & 2).
- Forty-four entries (Table 1) planted in July 2016. Mowed at 3.8 cm up to 3X wk<sup>-1</sup>, non-limiting soil moisture, 196 kg N ha<sup>-1</sup> yr<sup>-1</sup>.
- Sod performance characteristics assessed on 3 & 4 Aug 2017.
- Sod harvested using a walk-behind sod cutter, 30.5 cm wide blade, (Ryan Model 544844C, Textron, Racine, WI) at 13 months after planting [Figure 1].
- Sod pad dimensions were 38 cm x 30.5 cm x 1.5 cm (length x width x height).
- Sod handling quality (SHQ) assessed on a 1 to 5 visual scale where 1 = very poor quality, sod falls apart easily, 2 = Substantial cracking of sod strip, 3 = some cracking of sod pad, this is the suggested minimum quality for harvest of an existing commercial available product, 4 = very little cracking, suggested minimum quality for commercialization of new experimental varieties, 5 = excellent quality, no cracking of pad (Han, 2009).
- Sod tensile strength (STS) recorded as the peak force per cross sectional area (kg dm<sup>-2</sup>) required to tear apart sod pads using an electric actuator and force transducer (Model DFIS, John Chatillon & Sons, Inc., Greensboro, NC).
- Analytical design was a randomized complete block with three replications of entries.
- ANOVA conducted using General Linear Models Procedure (PROC GLM) in SAS version 9.4. The entry effect was significant so Fisher's Protected LSD test was used at  $p \leq 0.05$  to separate entry means.

## References

- Gopinath, L. 2015. An assessment of the sod handling quality and tensile strength of thirty-nine turf bermudagrasses. M.S. Thesis, Oklahoma State University, Stillwater, OK.
- Han, H.R. 2009. Development of improved turf-type bermudagrasses.

## Acknowledgements

Direct funding for this research was provided by the USDA – NIFA Specialty Crop Research Initiative Grant Number 2015-51181-24291 and the Oklahoma Agricultural Experimental Station (OAES). Appreciation is extended to Mr. Bart Frie, Mr. Dan Valdez and the staff of the OSU Field Research & Service Unit.



Figure 1: Oklahoma State University Turfgrass Team members assessing sod tensile strength and handling quality of warm-season turfgrass under field conditions.



Figure 2: Sod tensile strength (STS) was measured under field conditions using a portable tensile strength machine.

## Results and Discussion

- All entries had at least satisfactory sod handling quality (SHQ  $\geq 3.0$ ) [Table 1].
- Thirty-two of 40 experimental lines provided a SHQ of 4.0 or greater, which is the suggested minimum target SHQ by our program for any future bermudagrass releases.
- Entries with high sod handling quality often had higher sod tensile strength. However, the lines having the highest SHQ did not always have the highest STS. We suggest using both SHQ (a qualitative measurement) and STS (a quantitative measurement) in documentation of sod production performance of turfgrass entries.
- While Celebration and Latitude 36 ranked lower in SHQ in this particular trial, Celebration and Latitude 36 ranked in the top statistical group for SHQ of commercial and experimental bermudagrass entries in the 2013 NTEP Bermudagrass trial over three sampling dates at Stillwater, OK (Gopinath, 2015).
- Regrowth and time to second harvest will be assessed in future work.
- This and other experiments will be repeated across both geographic locations and time to determine the stability of the findings.

Table 1. Mean Sod Handling Quality (SHQ) and Sod Tensile Strength (STS) of Bermudagrass Entries.<sup>1</sup>

Entry #	Name	SHQ	SHQ Rank	STS	STS Rank
3	OSU1434	5.0	A	87.4	GHIJKLM
5	OSU1402	4.8	AB	87.3	HIJKLM
11	OSU1414	4.8	AB	113.8	BCDEF
24	TifB16104	4.8	AB	83.1	IJKLM
31	TifB16111	4.8	AB	141.9	A
2	OSU1428	4.7	ABC	121.5	ABC
7	OSU1406	4.7	ABC	110.7	BCDEFGH
8	OSU1408	4.7	ABC	100.8	CDEFGHIJ
9	OSU1409	4.7	ABC	117.5	ABCD
16	OSU1423	4.7	ABC	98.5	CDEFGHIJ
23	TifB16103	4.7	ABC	101.6	CDEFGHIJ
33	TifB16113	4.7	ABC	94.8	DEFGHIJK
10	OSU1412	4.5	ABCD	94.1	DEFGHIJKL
19	OSU1435	4.5	ABCD	85.6	HIJKLM
34	TifB16114	4.5	ABCD	84.5	HIJKLM
35	TifB16115	4.5	ABCD	98.2	CDEFGHIJK
40	TifB16120	4.5	ABCD	103.8	BCDEFGHI
42	TifTuf	4.5	ABCD	113.5	BCDEFG
6	OSU1403	4.3	ABCDE	128.2	AB
12	OSU1415	4.3	ABCDE	77.4	JKLMN
13	OSU1417	4.3	ABCDE	103.8	BCDEFGHI
14	OSU1418	4.3	ABCDE	78.8	IJKLMN
22	TifB16102	4.3	ABCDE	75.8	KLMNO
28	TifB16108	4.3	ABCDE	98.3	CDEFGHIJK
30	TifB16110	4.3	ABCDE	84.3	IJKLM
36	TifB16116	4.3	ABCDE	86.0	HIJKLM
39	TifB16119	4.3	ABCDE	91.2	EFGHIJKLM
44	Tifway	4.3	ABCDE	81.5	IJKLM
32	TifB16112	4.2	ABCDEF	76.2	JKLMNO
15	OSU1420	4.0	BCDEF	68.1	LMNOP
17	OSU1425	4.0	BCDEF	80.1	IJKLMN
18	OSU1433	4.0	BCDEF	79.2	IJKLMN
29	TifB16109	4.0	BCDEF	95.5	CDEFGHIJK
27	TifB16107	3.8	CDEF	79.6	IJKLMN
21	TifB16101	3.7	DEFG	72.2	KLMNOP
37	TifB16117	3.7	DEFG	67.8	MNOP
1	OSU1424	3.5	EFG	48.7	P
4	OSU1440	3.5	EFG	54.4	NPO
20	OSU1439	3.5	EFG	65.3	MNOP
26	TifB16106	3.5	EFG	88.0	FGHIJKLM
41	Celebration	3.5	EFG	81.6	IJKLM
43	Latitude 36	3.5	EFG	50.6	OP
38	TifB16118	3.3	FG	67.7	MNOP
LSD (p=0.05)		0.9		26.2	

<sup>1</sup>Sod handling quality was measured on a 1 to 9 scale where 1 = very poor quality, falls apart while handling, 3 = some cracking but satisfactory, suggested minimum quality for commercial sale, 4 = very little cracking of sod pads, suggested minimum quality for newly developed varieties and 5 = excellent quality and no cracking of sod pads when handled. Sod tensile strength (STS) was measured in kg dm<sup>-2</sup>.