Breeding and Evaluation of Turf Bermudagrass Varieties

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Objectives:

1. *Assemble, evaluate and maintain Cynodon germplasm with potential for contributing to the breeding of improved turf cultivars.*
2. *Development and use of simple sequence repeat molecular markers.*
3. *Improve bermudagrass germplasm for seed production potential, cold tolerance, leaf firing resistance, and other traits that influence turf performance.*
4. *Develop, evaluate and release seed– and vegetatively–propagated turf bermudagrass varieties.*

Bermudagrass is highly diverse in genetics and has been the most widely used warm–season turfgrass in the world. In the U.S., turf bermudagrasses are grown in approximately 90% of warm–season turf areas on golf courses in both the southern primary adaptation belt and the transition zone. Bermudagrass breeding in Cynodon dactylon (L.) Pers. (common bermudagrass), C. transvaalensis Burtt–Davy (African bermudagrass), and C. dactylon x C. transvaalensis (interspecific hybrids) continues to produce new cultivars contributing to the turf industry. The OSU turf bermudagrass breeding program made progress in the evaluation of seed–producing populations, development of simple sequence repeat (SSR) markers for African bermudagrass, evaluation of clonally propagated experimental hybrids and continued commercialization of two new cultivars in 2012.

Three common bermudagrass populations were subject to phenotypic selection. Two populations established at the Agronomy Research Station of OSU were evaluated primarily for seed yield components, i.e., seed set percentage and inflorescence prolificacy. Some plants in the two nurseries had a very good seed set. This was probably in part due to the weather conditions during bermudagrass flowering and seed maturing stages. Two OSU bermudagrass populations established in 2009 on the turf research center at the University Illinois, Urbana –Champaign, IL were evaluated for winter survival. Approximately 100 of the best performing survivors from these two nurseries were selected and planted in a replicated nursery on the OSU Agronomy Research farm in the summer of 2011. The cold hardy plants in the

Figure 1. Foundation sod of 'NorthBridge™' turf bermudagrass was prepared by Dr. Yanqi Wu's field assistants (Mr. Andrew Coffee in the image) for a licensed sod producer in 2012.

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Figure 2. OSU putting–green type bermudagrass evaluation trial performed by a graduate student, Wenwen Liu (on the right side in the image) and directed by Dr. Dennis Martin (on the left side in the image).

new nursery were evaluated for turf performance, seed yield and related traits in 2012 and the evaluation will continue in the following years.

One experiment was conducted to evaluate the allele frequencies of randomly selected genetic loci in the two cold hardy populations. Forty–four SSR markers were genotyped to characterize allele frequencies in the selected survival populations versus their respective original populations. The SSR markers collectively amplified 421 and 385 scorable polymorphic bands in the populations. χ 2 tests indicated significant allele frequency changes occurred in 15 loci in both populations. The results suggest a few of the significant markers are likely linked to winter survivability in the populations. The selected germplasm should be valuable for the development of new cold hardy turf cultivars in bermudagrass.

Two new clonal turf bermudagrass cultivars, ´Latitude 36™´ and ´NorthBridge™´ were licensed by the Sod Solutions, Inc. and delivered to three additional sod producers in 2012 (Figure 1). The two cultivars are clonally propagated F1 hybrids of Cynodon dactylon x C. transvaalensis. Last year data published online in the 2007–2012 NTEP National Bermudagrass Test (http://www.ntep.org/) indicated the two new cultivars continued to demonstrate exceptional turf quality, and many other desirable traits.

Genomic SSR markers are not currently available for African bermudagrass research. One experiment was conducted to develop and characterize genomic SSR markers in the species. Four small insert libraries enriched in core SSR sequences were constructed using the pUC19 plasmid. The SSR–enriched DNA inserts were sequenced at the Oklahoma State University Core Facility. The software program ´SSR Locator´ was used to identify SSR sequences and to design 1426 non–redundant SSR primer pairs. More than 800 SSR primer pairs produced reliable bands in validation tests.

Twenty–five putative experimental interspecific hybrid bermudagrass clones planted in 2010 were amongst 80 total lines in four experiments evaluated for traffic resistance in spring to fall 2012. A Cady–type traffic simulator was constructed to provide weekly traffic followed by both visual evaluation and digital image analysis for traffic resistance of genetic lines. Considerable differences in traffic resistance are present in our germplasm and amongst commercialized lines.

Seven OSU experimental bermudagrass lines were evaluated against three industry experimental lines and five commercial standards (´Tifgreen´, ´Champion Dwarf´, ´Mini–Verde´, ´Sunday´ and ´TifEagle´) under putting green conditions in 2012 (Figure 2). Green speed, genetic color, quality, texture, density and winter tolerance are being evaluated in two field trials at Stillwater, OK. Two OSU lines have been advanced for demonstration plots on lower maintenance putting greens in Oklahoma during 2013 in order to gather further Superintendent input. Two to three lines may be advanced to NTEP putting green testing in 2013.

Summary Points

- Common bermudagrass populations were subject to phenotypic selection.
- SSR marker analysis indicated significant allele frequency change occurred in some loci in the se–lected cold hardy germplasm as compared with the genotypes in the original populations.
- A large set of over 800 SSR markers were devel–oped from four African bermudagrass SSR–enriched genomic libraries.
- Two new clonally propagated turf bermudagrass cultivars, ´Latitude 36™´ and ´NorthBridge™´ were expanded in licensing for increased sod produc–tion in 2012.
- First–year testing of 80 bermudagrass lines (62 experimental, 18 commercial) found substantial differences in traffic resistance.
- Comparative testing of seven OSU putting green type bermudagrasses was conducted against five industry standards in 2012. Two OSU lines are being advanced to demonstration phase testing on lower maintenance golf courses in 2013.

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