History of Bermudagrass Turfgrass Breeding Research in Tifton, GA

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Additional index words. Cynodon dactylon, Cynodon transvaalensis, Tifton, Georgia, history

Abstract. Bermudagrass (Cynodon spp.) is the foundation of the turfgrass industry in most tropical and warm-temperate regions. Development of bermudagrass as a turfgrass began in the early 1900s. Many of the cultivars commercially available today have been cooperatively released by the U.S. Department of Agriculture Agricultural Research Service (USDA-ARS) and the University of Georgia at the Coastal Plain Experiment Station in Tifton, GA.

The Beginning of a Legacy

In 1946, Glen Burton and the USDA-ARS initiated a turfgrass breeding program in Tifton, GA to develop better bermudagrasses to replace sand putting greens or seeded varieties (Burton, 1991). Researchers scouted golf courses throughout the southeastern United States and collected accessions from the best turf-type bermudagrasses to be increased in a greenhouse and planted in field plots. These accessions were then crossed with common bermudagrasses [Cynodon dactylon (ecotype: Tifton, GA); 2n = 4x = 36]. The resulting progeny were subjected to standard golf green management practices before the best F1 hybrid was selected for greater density, less weed presence, and greater disease resistance than the common ecotype (Burton, 1991; Hein, 1953). This tetraploid hybrid (2n = 4x = 36) was released as Tifton 57 in 1952 and later commercially named ‘Tiflawn’ (Burton, 1991).

Although ‘Tiflawn’ showed improvement over existing bermudagrass cultivars, it was taller and coarser than desired (Burton, 1991). Cynodon transvaalensis (2n = 2x = 18) accessions from South Africa typically have fine leaves and made better putting surfaces than C. dactylon, but were very susceptible to diseases (Burton, 1991; Hein, 1953). ‘Tiflawn’ was crossed with C. transvaalensis and a superior genotype with finer, softer leaves and greater disease tolerance than the parent lines was selected (Burton, 1955; Hein, 1953; Robinson and Burton, 1953). This turfgrass was released as Tifton 127 and commercially named ‘Tifline’ in 1953 for athletic fields and school play-grounds (Burton, 1991). This was the first vegetatively propagated, triploid hybrid (2n = 3x = 27) released from the cooperative turfgrass breeding program in Georgia.

Next, researchers aimed to improve the putting surface of bermudagrass by making hybrids between a C. dactylon selected from the fourth green of the Charlotte Country Club (Charlotte, NC) and C. transvaalensis (Burton, 1951; Hein, 1961). The best of these sterile triploid hybrids was released as Tifton 328 in 1956 and commercially named ‘Tifgreen’ (Burton, 1991). ‘Tifgreen’ was a popular choice for putting surfaces worldwide, as it was fine-textured with soft, forest green leaves and few seedheads (Burton, 1964, 1991).

An unintended triploid hybrid of C. transvaalensis and C. dactylon, discovered in 1954, was released as Tifton 419 and commercially released as ‘Tifway’ in 1960 (Burton, 1966a). The female parent was that of a C. transvaalensis seed lot provided by D. Meredith from South Africa (Burton, 1966a). Since ‘Tifway’ was triploid, the male parent was presumed to have been C. dactylon (Burton, 1966a). This hybrid was darker green than ‘Tifgreen’ and exhibited greater frost tolerance, disease and insect resistance, and wear tolerance (Burton, 1991). The denser, weed-free sod with greater leaf stiffness was coveted for tees and fairways. ‘Tifway’ has since become the standard to compare against when developing new turf varieties (Burton, 1991). Although ‘Tifway II’ and ‘Tifgreen II’ resulted from this initial experiment and were released in 1981 and 1983, respectively (Burton, 1981, 1991). Even though ‘Tifway II’ was visually similar to ‘Tifway’, it was reported to be more resistant to root knot (Meloidogyne spp.), ring (Mesocriconema ornatum Raski), and sting (Belono-laimus longicaudatus Rau) nematodes, more frost tolerant, and broke dormancy earlier in the spring (Burton, 1991). It produced a denser sod with fewer weeds, hypotheti-cally making ‘Tifway II’ a better choice for lawns, fairways, and football fields (Burton, 1981). Despite this, the use of ‘Tifway II’ was relatively limited compared with ‘Tifway’.

Improving Winterhardiness

Following the release of ‘Tifgreen II’, the Tifton Turfgrass Breeding Program created a new goal, to develop higher-quality, more winter-hardy bermudagrasses (Burton, 1991). In 1974, a hexaploid bermudagrass collection from a lawn in Shanghai, China, was introduced into the program because of its dark blush-green color, winterhardiness, salt tolerance, and ring nematode resistance (Burton, 1991; Hanna et al., 1990). Although it was coarser and did not tolerate wear traffic

Received for publication 30 May 2018. Accepted for publication 10 July 2018.

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Protecting the Future of Turfgrass Breeding

Despite the many successful bermudagrass cultivar releases, there were several problems facing the future of turf bermudagrass in the 1990s. First, golfers demanded improved putting green quality compared with that provided by creeping bentgrass (Agrostis stolonifera L.) found in the northeastern United States (Hanna, 1996). The existing releases could not withstand the low mowing heights required to achieve a comparable putting surface without losing stand density and quality. Second, there was a lack of reliable planting stock because of unplanned mutations and contamination in nursery fields. Finally, susceptibility to pests was a major concern, as there were largely only two cultivars being utilized throughout the southeastern United States. There was a clear need for genetically different cultivars that could maintain quality and persistence at mowing heights less than 4 mm.

Therefore, the next goal of the Tifton Turfgrass Breeding Program was to develop dwarf cultivars with more stringent standards for certification (Hanna, 1996). Researchers again decided to induce mutations into established cultivars using cobalt-60 gamma-radiation to increase genetic diversity while reducing the time required for the next cultivar release. Tift 94 and TW-72 were, respectively, released in 1995 and 1997 and were correspondingly named ‘TifSport’ and ‘TifEagle’ (Hanna et al., 1997; Hanna and Elsner, 1999). These were the first hybrid bermudagrasses to be patented from Tifton. Both cultivars were selected for persistence under close mowing and lower levels of tawny mole cricket (Scapteriscus victims Scudder) infestation compared with the previously superior ‘Tifway’ and ‘Tifdwarf’ (Hanna et al., 1997; Hanna and Elsner, 1999). ‘TifSport’ had greater canopy density than ‘Tifway’ and exhibited increased cold tolerance, allowing it to be planted farther north (Hanna et al., 1997). ‘TifEagle’ resulted in a better putting surface, as it had fewer seedheads and produced more stolons and shorter, narrower leaves than ‘Tifdwarf’ (Hanna and Elsner, 1999).

After these two releases, focus was put on improving the shade tolerance of bermudagrass for lawns, golf courses, and other landscapes where light may be reduced. Six C. transvaalensis genotypes were selected for their persistence under low management and crossed with six C. dactylon cultivars known for their cold tolerance or persistence under close mowing during 1992 (Hanna et al., 2010). Beginning in 1999, 60 of the resulting hybrids were selected under continuous shade conditions where light was always reduced by at least 60% of photosynthetically active radiation. A naturally darker green, dwarf-type genotype was discovered that maintained quality under shade and was released as ST-5 in 2009 and commercially named ‘TifGrand’.

Innovation for the Future: Drought Tolerance

Today, the goal of the Tifton Turfgrass Breeding Program is to develop cultivars that are adapted to a broader range of environments and have improved drought tolerance. The latter is particularly important, as irrigation restrictions during drought events are becoming more common. The latest commercial turfgrass release is ‘DT-1’, an interspecific hybrid triploid (2n = 3x = 27), that was evaluated in 19 drought-stress trials throughout the United States before it was commercially released. ‘DT-1’ can better withstand drought and traffic than previous commercial releases. In addition, it was generally faster growing than other bermudagrass cultivars and maintained turfgrass cover and green color longer each fall. ‘DT-1’ was co-released by the University of Georgia and the USDA-ARS in 2014 after more than 20 years of evaluations and commercially named ‘TifTuf’.

For additional information about the Tifton Turfgrass Breeding Program or any of the commercial releases, please visit http://georgiacultivars.com/cultivars/turfgrass.

Literature Cited