Three University Cooperative Effort to Develop Cold Hardy Zoysiagrass Cultivars with Large Patch Tolerance for the Transition Zone

Keenan Amundsen
University of Nebraska

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Objectives:

1. *The seeded cultivar Sundancer became commercially available in 2014*
2. *Identified shade and traffic tolerant buffalograss accessions*
3. *Diagnostic genetic markers were developed that can differentiate leaf spot resistant and susceptible buffalograss*

Buffalograss is often considered the model for low input sustainable turfgrass species. Buffalograss forms a dense sod when good weed control, establishment, and management practices are followed. It has exceptional temperature, drought, and pest tolerance when grown in its primary adaptation range. However, some abiotic stresses negatively impact buffalograss functional quality and the University of Nebraska-Lincoln (UNL) is developing buffalograss cultivars with resistance to these stresses.

For example, low mowing, shade, and traffic tolerance are important traits for buffalograss turf. Low mowing tolerance is important when growing buffalograss with high turf quality expectations. Through targeted breeding efforts, we developed low growing buffalograss genotypes with relatively short (<1.5 cm) stolon internodes. Short stolon internodes could contribute to high shoot density and the low growing phenotype could improve functional performance at low mowing heights. Seven of these accessions along with Legacy and Prestige buffalograss were evaluated for low mowing tolerance (5/8”) during the summer of 2014. Three experimental lines were identified that had good establishment rate, canopy density, and mowing tolerance when compared to the standard entries (Figure 1). Buffalograss is often considered to be intolerant of shade. To identify sources of shade

Figure 1. Low mowing tolerance of experimental buffalograss lines selected for short stolon internode length.

Figure 2. Shade tolerance evaluation of experimental buffalograss lines grown under a shade cloth that blocks 60% natural light.

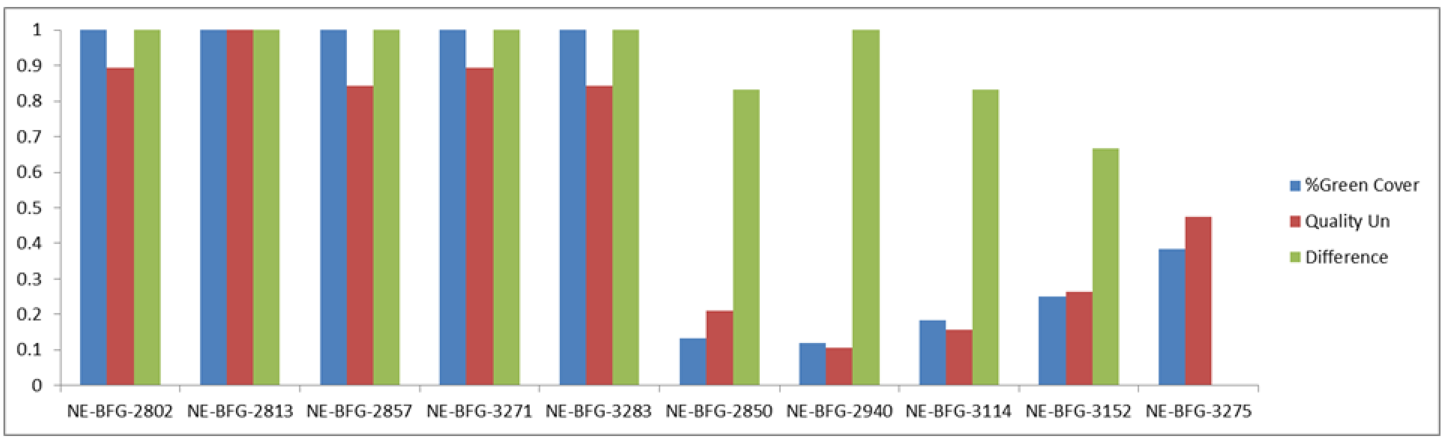

Figure 3. Functional performance of the best and worst genotypes following two years of traffic pressure. August 2014 data is presented and all values are normalized to a 0-1 scale. A portion of each plot was left untrafficked to determine genotypic turfgrass quality, represented by Quality Un. Difference represents 1 - the normalized difference in turfgrass quality between the un-trafficked and trafficked plots.

tolerance, 35 buffalograss lines were grown under a 60% shade cloth. Twenty two of the accessions survived and four formed an acceptable turf (Figure 2). Similarly, traffic tolerance is an important characteristic for managed turf. Traffic tolerance of 104 buffalograss accessions was evaluated for two years. Turf quality and percent green cover data was collected monthly throughout the growing season following traffic treatments. Several accessions were identified that showed no visible signs of damage when comparing trafficked and untreated plots (Figure 3). These data together provide new insights for how different germplasm sources can contribute to abiotic stress tolerance in future buffalograss cultivars.

The buffalograss breeding program has also been using modern genetic tools to improve breeding efficiency. Separate next generation sequencing studies were used to understand changes in buffalograss gene expression during inflorescence development, gender

Figure 4. Sundancer buffalograss became commercially available during the 2014 growing season.

expression, chinch bug feeding, and leaf spot disease development. Data from these studies contributed to the development of a comprehensive buffalograss transcriptome. The transcriptome is used to characterize genes important to buffalograss response to these conditions. As an example, 1,431 genes were differentially expressed between leaf spot resistant and susceptible genotypes. Genetic markers were developed for 17 of the genes and four clearly differentiated leaf spot resistant and susceptible buffalograss genotypes. These markers are being used to pre-screen germplasm for resistance, improving the efficiency of breeding for leaf spot resistance. Similar studies are underway to characterize gender before inflorescence development and identify novel germplasm sources of chinch bug resistance.

The summer of 2014 was marked by the 30 year anniversary of a collaborative research agreement between the USGA and the UNL buffalograss breeding program. It is fitting that during this anniversary year, the release of the buffalograss seeded cultivar Sundancer was announced (Figure 4). Sundancer was developed by UNL through support received from the USGA and the Native Turfgrass Group. During development, Sundancer was evaluated at six distinct locations within its zone of adaptation along with locations in Virginia and Washington. During establishment across all locations, Sundancer outperformed the other seeded entries for establishment rate, turfgrass quality, genetic color, and canopy density. After establishment, Sundancer had superior turfgrass quality, genetic color, spring green-up, and canopy density. Sundancer is a broadly adapted seeded buffalograss that is a reflection of the advancements made by the UNL buffalograss breeding program over the past three decades.