Low Input Performance of Highland, Heat, and Drought Tolerant Bentgrasses

Keenan Amundsen and William Kreuser—University of Nebraska
Leah Brilman—Seed Research

USGA

Objectives:

The goal of this research is to evaluate GRIN Agrostis germplasm collected from southern Europe, southwest Asia and parts of Africa for performance at two mowing heights (5/8" and 3") along with their seed production potential.

There are more than 150 different Agrostis species (bentgrasses) but only five are routinely used for turf including *A. stolonifera* (creeping bentgrass), *A. canina* (velvet bentgrass), *A. capillaris* (colonial bentgrass), *A. castellana* (highland bentgrass), and *A. gigantea* (redtop bentgrass). Bentgrass breeding programs have made remarkable gains in uniformity, aesthetics, and functional quality of creeping bentgrass over the past several decades. However, there is always demand for better functional and aesthetic quality in the next generation of cultivars compared to those currently available.

Wild germplasm may harbor desirable genes, such as those for traffic, shade, drought, heat, or pest resistance. Plant breeders can transfer these desirable characteristics from wild germplasm to elite germplasm through interspecific hybridization, which is common among bentgrasses. Wild germplasm is not often used by bentgrass breeding programs because the material has poor turf quality, slowing the productivity of new cultivar development. The National Plant Germplasm System (NPGS) of the USDA-ARS Germplasm Resources Information Network is a repository for plant genetic diversity and it houses the largest publicly available bentgrass collection within the United States.

Figure 1. Source of National Plant Germplasm System (NPGS) bentgrass accessions evaluated for long-term low-input sustainability.

In this study, we tested field-based performance of 69 alternative NPGS bentgrasses representing 10 distinct species. The majority of the NPGS accessions were chosen because they were collected from regions of warmer and more arid climates than much of the United States (Figure 1). Highland bentgrasses were also selected, mostly originating from southern Europe, because this species has good turf characteristics but is not commonly used for turf in the U.S.

USGA

Figure 2. Unmown National Plant Germplasm System (NPGS) bentgrass accessions were evaluated for canopy architecture features at different stages of development. This image was taken seven weeks after planting and demonstrates variability among the accessions.

Due to limited seed supply, each accession was seeded in pots in the greenhouse and vegetatively propagated to increase the amount of plant material. Each bentgrass line was plugged into 25 sq ft field plots at 1 ft spacing during the spring of 2013 (Figure 2). Three separate RCBD studies with three replications each were established to evaluate the NPGS bentgrasses alongside T-1, Alpha, and Penncross. One study represents a fairway and is mowed regularly at 5/8", another represents a typical lawn and mowed at 3", and the third study is not mowed and is used to evaluate seed production potential and canopy architecture.

During the summer of 2013, the mowed studies were evaluated for genetic color, canopy density, establishment rate, and leaf texture. Two *Agrostis stolonifera*, two *A. castellana*, and three *A. gigantea* plant introductions performed among the best in all rating categories along with the named cultivars (Figure 3). Accessions with coarse texture and upright growth may perform well in a lawn setting, while other accessions with finer leaf texture

and high shoot density may be important for bentgrasses grown on golf course putting greens.

In this preliminary study, we evaluated 69 NPGS bentgrass accessions representing a small subset of the more than 150 bentgrass species. We identified seven bentgrass plant introductions that well for the traits evaluated. Long term performance and persistence data is needed, but this material could provide novel traits that could be incorporated into bentgrass breeding programs to improve the next generation of bentgrass cultivars.

Summary

- There are more than 150 different bentgrass species, but only five are commonly used for turf
- Alternative bentgrasses are reservoirs of novel genetic diversity
- We identified *Agrostis* introductions that performed as well as named cultivars for establishment rate, canopy density, genetic color, and texture.
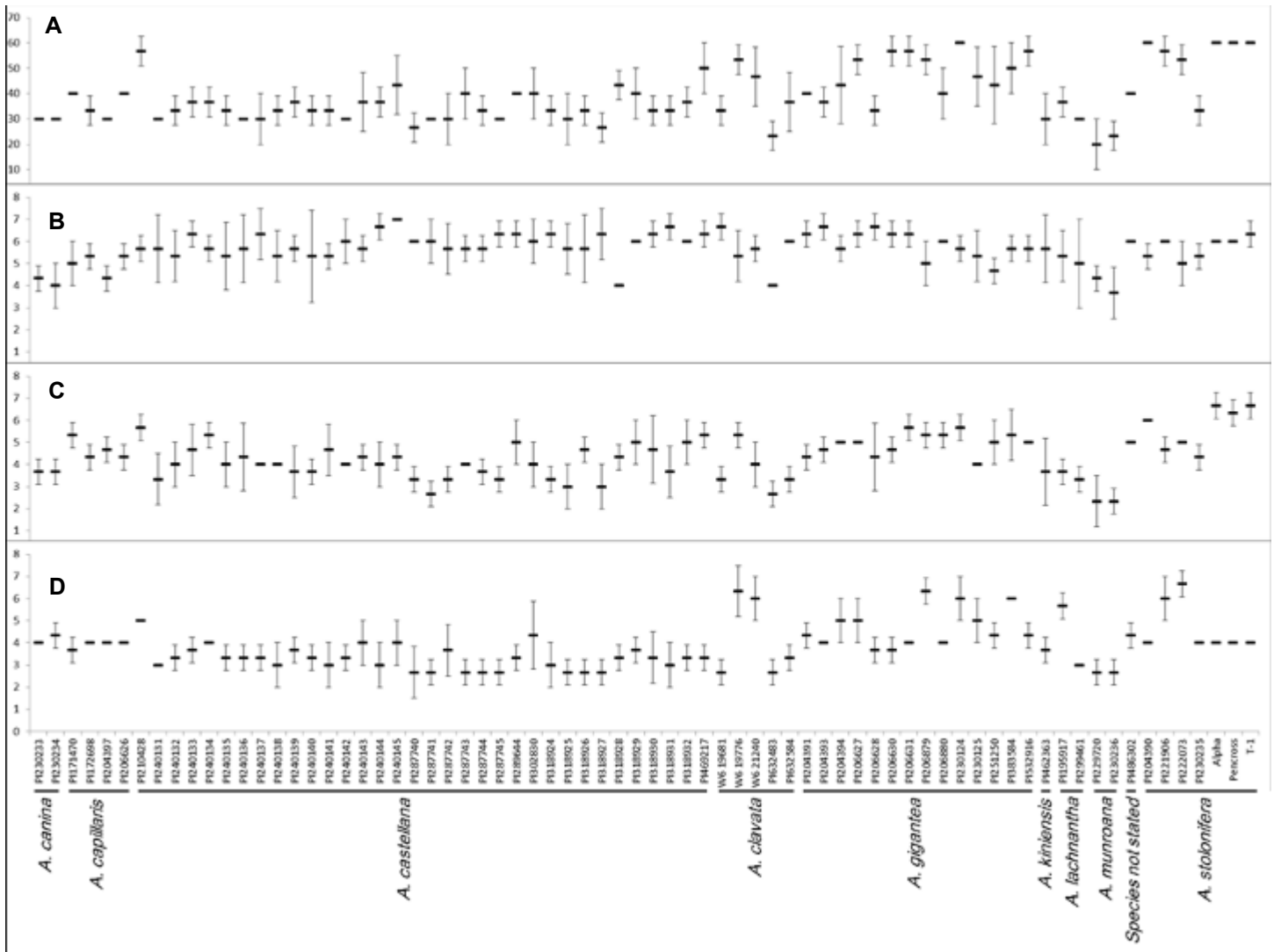
Figure 3. Performance evaluation of 72 bentgrass accessions. The mean ratings for each accession are indicated and error bars represent standard deviation across the three replications. A. - Establishment rate was measured as percent plot coverage five weeks after planting. B. – Genetic color was rated on a one to nine scale with one being light green and nine being dark green. C. – A visual estimate of canopy density with one representing a sparse/thin canopy and nine representing a dense canopy. D. – Leaf texture was evaluated relative to the standard entries and lower values indicate finer leaf texture while larger values indicate coarser leaf texture.