Project Title: Genetic Improvement of Prairie Junegrass

Project leader: Eric Watkins

Affiliation: University of Minnesota

Objective:

1. Determine the genetic potential of native prairie junegrass germplasm for use as low-input turfgrass.

Start Date: 2007
Duration: nine years
Total Funding: $90,000

Prairie junegrass (*Koeleria macrantha*) has shown the potential to be successfully used as a turfgrass in lower-input environments. The species is widely distributed throughout much of the western United States and can also be found throughout much of Europe and Asia. The species has several attributes that would make it a useful low-input turfgrass including drought tolerance, survival of low and high temperature extremes, and reduced vertical growth rate. We have evaluated material from our collection and material from the USDA National Plant Germplasm Resources Network (NPGS) and used those evaluations to assemble breeding nurseries.

Currently, there are a small number of cultivars that have been developed from germplasm collected in western and northern Europe; however, these cultivars are difficult to obtain and the seed quality is often not adequate. Germplasm from North America has greater seed production potential and resistance to important diseases, but does not possess acceptable turf quality. Most of this turf quality decline is due to shredded leaves from mowing and an early onset of summer dormancy during stress periods. Poor mowing quality is a challenging problem in this species, and one approach to improvement in this area may come from studying silica bodies.

Grasses have specialized silica cells that produce bodies that are distinguishable as silica bodies. Silica bodies can have many important physiological roles in plants such as decreased herbivory and stress tolerances such as decreased fungal colonization and salinity tolerance. These bodies could also be responsible for some of the differences we have observed in mowing quality between North American and European genotypes (Fig. 1). We have developed a method that combines dry-ashing, fluorescence microscopy and image processing for the high throughput quantification of silica bodies in *Koeleria macrantha* leaf tissues.

We examined 14 accessions and cultivars of prairie junegrass and found significant differences between accessions (Fig 2). We observed some accessions that have a significant difference in spatial silica body deposition as well as silica body number and the leaf area occupied by the silica bodies. These differences may be resulting in turf performance differences, but we have not yet conducted the experiments necessary to confirm this. Our method should be useful for quantification in other grass species as well as we have observed this technique useful in over 20 different species ranging from sedges and cereal grasses to cool-season and warm-season turfgrasses (Fig. 3). This method could be useful for plant breeders selecting grasses with better mowing quality and increased stress tolerance.

Summary Points:

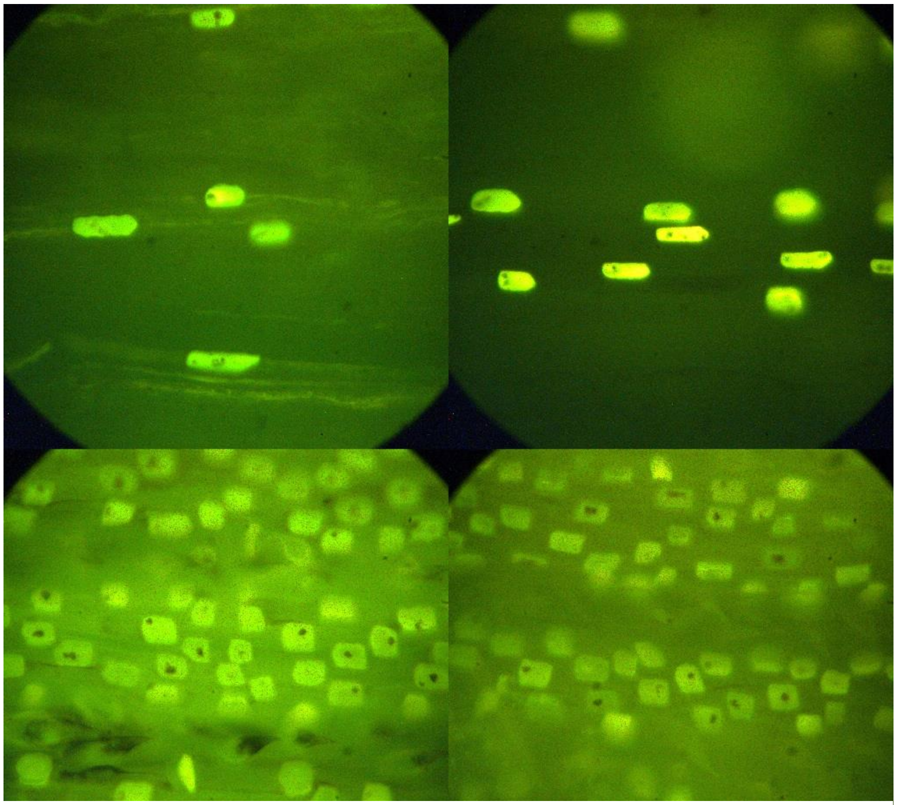
- We have developed a new method for dry ashing and high-throughput image processing of silica bodies in turfgrasses
- We found significant differences in silica body number between accessions of prairie junegrass as well as significant differences in spatial deposition and the leaf blade area occupied by silica bodies
- Preliminary results suggest that higher silica body count is correlated with decreased mowing quality.
- Silica body imaging may lead to rapid screening of native grasses that can perform well under mowing.

Figure captions:

Figure 1. This image shows the silica body arrangement in leaves from *Koeleria macrantha* genotypes originating from Minnesota (bottom images) and Ireland (top images). The accession from Ireland has very good turf quality under low-input turfgrass management.

Figure 2. We found significant differences between prairie junegrass accessions and cultivars (Barkoel and Barleria) for mean number of silica bodies.

Figure 3. Images of silica bodies from other grass species. From left to right: teff (*Eragrostis tef*), Chewings fescue, blue hard fescue, perennial ryegrass, sheep fescue, and tall fescue.



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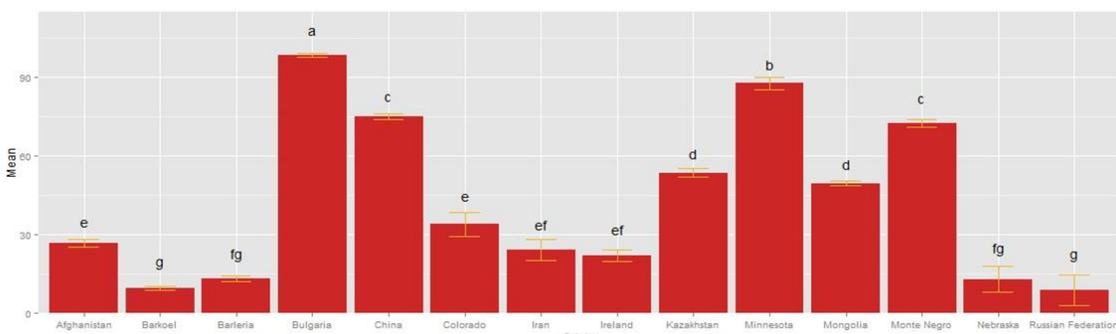

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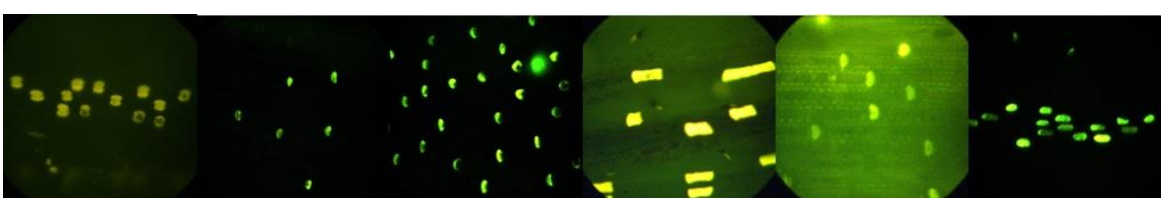

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