

# Genetic Improvement of Prairie Junegrass

Eric Watkins  
University of Minnesota

## Objectives:

1. Determine the genetic potential of native prairie junegrass (*Koeleria macrantha*) germplasm for use as low-input turfgrass.

**Start Date:** 2007

**Project Duration:** three years

**Total Funding:** \$30,000

Grass species that are native to North America should be better able to cope with our environment and could lead to overall reductions in inputs such as fertilizers, pesticides, and water. Prairie junegrass (*Koeleria macrantha*), which is native to the Great Plains of the United States, 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 it can also be found throughout much of Europe and Asia. Based on data that has been collected in recent years, this species appears to perform well in Minnesota under low-input conditions (no irrigation, limited nitrogen application, and no fungicide or insecticide applications).

Prairie junegrass has several attributes that would make it a useful low-input turfgrass in Minnesota including tolerance of droughty and alkaline soils, tolerance of sandy areas, survival of low and high temperature extremes, and reduced growth rate. 'Barkoel' was the first cultivar of this species specifically developed for use as a turfgrass. However, this cultivar was developed with ecotypes from Europe. We are proposing the development of a cultivar primarily derived from germplasm native to North America.

Developing a high quality turf-



In 2007, a mowed spaced-plant evaluation was established in both St. Paul and Becker, MN.

grass is not, by itself, adequate. In order to be used by consumers, an economically viable turfgrass cultivar must be able to produce sufficient quantities of seed. Non-selected populations of the species can produce seed for 4-5 years. Collections of natural ecotypes made in 2005 suggest that individual genotypes may possess the ability to be highly productive; however, it is unknown if it can produce economically adequate amounts of seed.

In order for a cultivar of this species to be used on a wide scale, two criteria must be met: 1) the cultivar must possess adequate turfgrass quality in a medium-to-low maintenance management situation, and 2) the cultivar must possess adequate seed production traits so that a sufficient supply of seed can be produced at a reasonable cost.

We have collected native prairie junegrass germplasm from Minnesota, South Dakota, North Dakota, Colorado, and Nebraska. These germplasm collections have been established in breeding nurseries, and in some cases, experienced one cycle of selection. We have established several spaced-plant evaluations that will be used to determine the genetic variation present in our populations for various turfgrass and seed production characteristics.

In 2007, a mowed spaced-plant evaluation was established in both St. Paul and Becker, MN. The study consisted of 48 accessions from the USDA National Plant Germplasm Resources Network. During the growing seasons of 2008 and 2009, the trial was maintained with minimal inputs (mowed weekly, no supplemental irrigation, a single nitrogen application each fall at 48.8 kg ha<sup>-1</sup> N, no fungicides or insecticides). Data collected included turfgrass quality and mowing quality.

Accessions varied significantly for overall turfgrass quality. Factors such as summer dormancy, leaf rust incidence, and leaf shredding played a role in decreased quality of several accessions. Mowing quality is one of the primary barriers that must be overcome if a cultivar of



Factors such as summer dormancy, leaf rust incidence, and leaf shredding played a role in decreased quality of several accessions.

this species is to be developed. Accessions showed high levels of variability for this trait at both locations. An accession from Ireland (PI 430287) out-performed accessions from other regions for both mowing quality and overall turfgrass quality. This collection is characterized by dark green color, excellent mowing quality, and superior turfgrass quality. In a related study, we found that this accession had poor seed yields when grown in Minnesota.

This study confirms that the USDA NPGS accessions can provide valuable turf quality traits; however, our previous research has indicated that few of these accessions have adequate levels of seed production when grown for seed in Minnesota. Seed production evaluations in Minnesota have also shown that material collected in the northern half of the United States has superior seed production to most non-native accessions. Combining the positive characteristics of the native and non-native populations in our breeding program may provide the best possibility for the development of a useful low-input cultivar.

## Summary Points

- Mowing quality of some non-native collections is superior than native germplasm
- Many accessions have adequate turfgrass quality under low-input conditions.
- Integration of traits from diverse germplasm should be effective in the development of a low-input cultivar.