

Genetic Improvement of Prairie Junegrass

Eric Watkins

University of Minnesota

Objective:

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

Start Date: 2007

Project Duration: 5 years

Total Funding: \$50,000

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 low-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.

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 vertical 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 turfgrass 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. Evaluations of natural ecotypes made since 2005 suggest that individual genotypes may possess the ability to be highly productive. In order



Evaluating native *Koeleria macrantha* germplasm for seed production potential in Roseau, MN (photo credit: Donn Vellekson).

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 evaluated this material in spaced-plant seed production trials, mowed spaced-plant evaluations, and low-input turfgrass trials.

In addition to evaluating native material, we have done extensive evaluation of germplasm from other countries that are available from the USDA National Plant Germplasm Resources Network (NPGS). Taken together, these numerous evaluations have indicated that the greatest potential for a successful low-input prairie junegrass cultivar for golf course roughs and other landscapes is possible. However, the best opportunity for advancement will be through a combination of native and non-native material.

It has become clear that cultivars developed with European germplasm, most prominently 'Barkoel' and 'Barleria', have many of the traits necessary to produce a slow growing, winter hardy, stress-tolerant turfgrass for use throughout the northern United States. These cultivars maintain attractive green color and slow vertical growth rate throughout summer stress periods without any inputs.

The barriers that have kept these cultivars from establishing a market presence are primarily inconsistent seed production and issues with seed quality and germination. Fortunately, the native germplasm that we have been evaluating and advancing can contribute higher seed production potential, and we have also seen improved seed quality and germination in our populations.



Turf plot evaluations of *Koeleria macrantha* accessions and breeding material in St. Paul, MN showing high turfgrass quality of European cultivars.

We have initiated a project to make crosses between the European populations and our native populations. Due to differences in ploidy levels (the best European germplasm is tetraploid while most native germplasm we have collected is diploid), and anecdotal hybridization obstacles, this effort may take some time. Nevertheless, we are hopeful that this will lead to the development of an economically viable cultivar.

Combining the higher turfgrass quality of the non-native collections with the superior seed production potential of the native germplasm should result in a cultivar that can be used effectively throughout the northern United States on low-input turf areas such as golf course roughs.

Summary Points

- Non-native germplasm generally exhibits superior turfgrass quality but has lower seed production potential.
- Integration of traits from diverse germplasm should be effective in the development of a low-input cultivar.
- Research to initiate crosses between diploid and tetraploid populations has begun.