

Research You Can Use

The Case for Prairie Junegrass

Research is underway at the University of Minnesota to improve a native cool-season turfgrass.

BY ERIC WATKINS



Collecting prairie junegrass in southeastern Minnesota.

OBJECTIVE

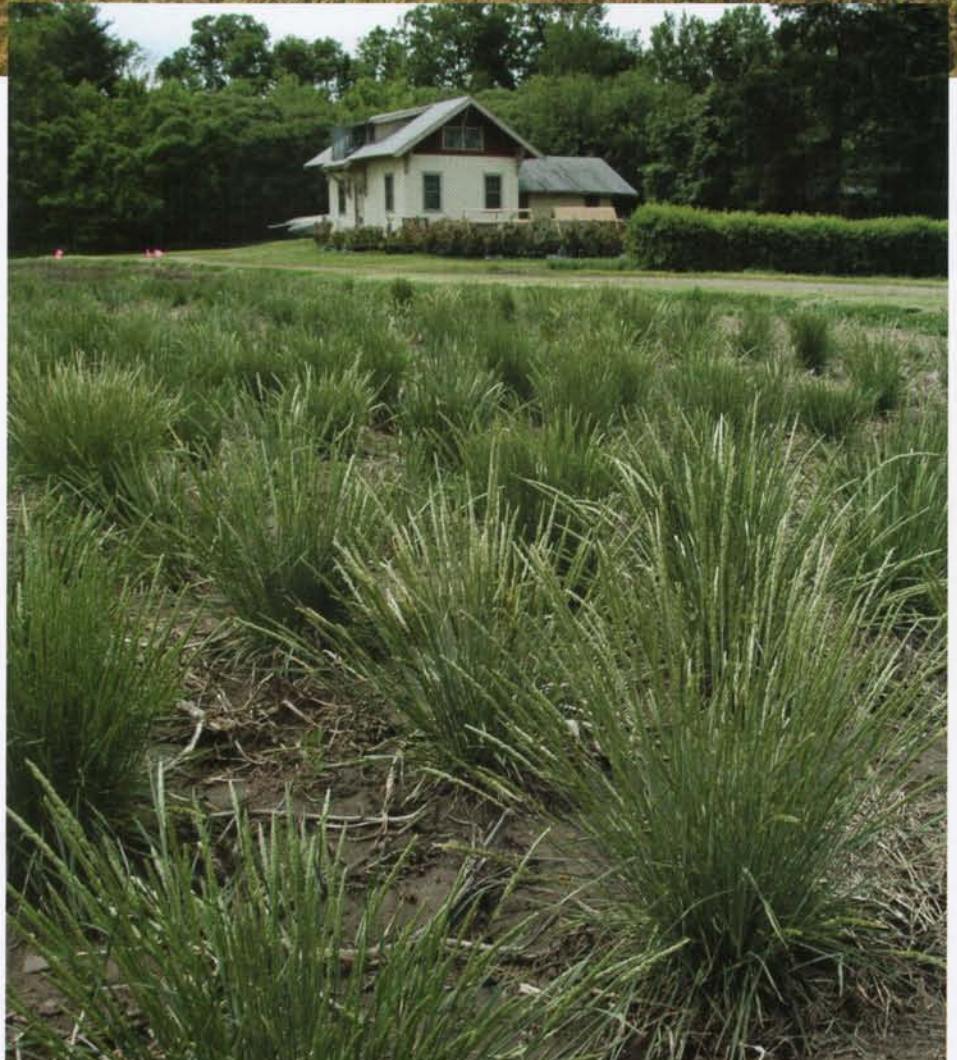
To determine the genetic potential of native prairie junegrass (*Koeleria macrantha*) germplasm for use as a low-input turfgrass.

Start Date: 2007

Project Duration: Three years

Total Funding: \$30,000

Grass species that are native to North America may be better able to cope with our environment and could lead to overall reductions in 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 also can be found throughout much of Europe and Asia. Based on data that have been collected in recent years, this species appears to perform well in Minnesota under



The material for this prairie junegrass breeding nursery was originally collected in western North Dakota.



Preliminary results from the mowing study indicate that sufficient variation for many important turf traits exists in the USDA collection.

Poor mowing quality of a *Koeleria macrantha* genotype is exhibited by the lack of a clean cut and frayed ends.



low-input conditions (limited nitrogen application; no irrigation, 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 propose the development of a cultivar using germplasm native to North America.

An economically viable, seeded cultivar must be able to produce sufficient quantities of seed. Non-selected populations of the species can produce seed for four or five years. Collections of natural ecotypes made in 2005 suggest that individual genotypes may

possess the ability to be highly productive. At this time, 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 medium to low-maintenance management situations, 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, two experiments were established in both St. Paul and Becker, Minn. The first experiment evaluated the USDA collection of *Koeleria macrantha* for seed production potential in Minnesota. The second experiment evaluated the same collections for turf potential as mowed spaced plants.

The seed production study is now complete, and we found significant variation among accessions. Collections that showed high levels of seed production potential included germplasm collected in Iowa. Collections with low levels of seed production were generally from areas of southwestern Asia. Based on these results, we will place additional focus on the inclusion of local collections in our breeding program in order to improve the seed production potential of the species.

CONNECTING THE DOTS

An interview with DR. ERIC WATKINS regarding the work at the University of Minnesota to develop prairie junegrass as a turfgrass.

Q: One of the reasons you chose prairie junegrass as a candidate for turfgrass development is the fact that it is native to North America. However, this grass has a very broad geographical distribution globally, as well, extending across Europe, most of temperate Asia, and even to the Indian sub-continent. What was it about prairie junegrass that most impressed you and suggested it might be a good candidate to develop into a turfgrass?

A: The broad distribution of the species suggests that it might possess a wide range of tolerances to extreme environmental conditions such as extreme heat or cold. The distribution of the species also presents great opportunities for germplasm collection.

Q: If you are successful in developing prairie junegrass as a turfgrass, what niche do you see it occupying, and what turfgrasses currently occupying that niche would it have to compete with?

A: This would be a grass for use in lower-input areas that receive significant sunlight. Golf course roughs, city parks, and home lawns in Minnesota primarily consist of Kentucky bluegrass and perennial ryegrass, species that can be considered high input. Many turf managers and homeowners are looking for lower-input options in these types of areas. Other underutilized turfgrasses, such as hard and chewing fescue might also be able to replace higher-input species in these situations.

Q: As a grass species that grows well on sandy, drought-prone soils, prairie junegrass might seem like a likely candidate for low-maintenance, non-irrigated sites. However, does prairie junegrass's poor performance on heavy soils, wet soils, or heavy shade limit its usefulness for golf course roughs?

A: That's an excellent question. I'm not sure we have enough data to say that improved cultivars of this species would do poorly in all of the situations you mention. If shade-tolerant cultivars cannot be developed, mixing with low-input shade-tolerant grasses may provide a solution for golf course roughs with a mix of sun and shade.

Q: According to what I've read about prairie junegrass, also referred to as crested hair grass, it is one of the first grasses to green up in the spring, but it will go dormant in hot, humid areas. To what extent do you think that would limit its useful range?

A: This is a major concern that we hope to address in our breeding program. We have observed some variability in summer dormancy in our germplasm, and we hope to select material that maintains a green color throughout the summer. Summer dormancy is an

important survival mechanism, so selecting against that trait could cause other problems.

Q: Do you think that the gray-green color of prairie junegrass's leaves represents a marketing obstacle in this country, where consumer preference clearly favors a dark green appearance?

A: As consumers continue to demand lower-input turfgrasses, there will need to be a shift in expectations. If a high-input turfgrass cultivar is growing in a non-irrigated area, its performance will be much reduced compared to growth under ideal conditions. Focusing on that difference, rather than the quality difference when both are grown with high inputs, should be convincing to most turf managers and other consumers.

Q: It sounds to me that prairie junegrass turfgrass cultivars would most likely occupy the same niche as tall fescue. Is that the way you see it? Are there characteristics about prairie junegrass that would make it a better choice than tall fescue for certain situations?

A: Not necessarily. Although we are encouraging more turf managers to utilize tall fescue in Minnesota, the species can be damaged by extended ice cover and can experience some winter-kill during the first winter after a fall seeding. Tall fescue is a drought-avoidant grass, but it still requires more water than would be desirable in a low-input situation. An improved prairie junegrass cultivar would ideally use very little water compared to other cool-season turfgrasses, and it would not have any winter hardiness issues in Minnesota and similar climates.

Q: A quick check on the Internet reveals that prairie junegrass is actively marketed as an ornamental grass, presumably because of its large inflorescence while still being a relatively short (<2 feet tall) open prairie species. When you go on collecting trips, is it these showy seed heads that most easily lead you to stands of prairie junegrass?

A: Yes, the seed heads are very distinctive and make collecting much easier. In areas where we have collected, the species is not widespread, so this trait helps with quick species identification.

Q: Prairie junegrass is one of the most widely distributed native grasses in North America. What have you learned so far in your selection and development process that would encourage or discourage you about this native species?

A: I am very encouraged by the seed production potential of this species. Although there are several characteristics that are going to be a challenge to improve (mowing quality, summer dormancy, establishment rate), the variability we have seen in our initial collections indicates that an aggressive germplasm improvement program can be successful.

JEFF NUS, PH.D., manager, Green Section Research.

Preliminary results from the mowing study indicate that sufficient variation for many important turf traits exists in the USDA collection. Of particular interest to our program are differences in mowing quality and the ability to maintain green color through summer stress periods. The mowing study will continue through 2009, and top-performing accessions will be integrated into our breeding program.

SUMMARY POINTS

- Native prairie junegrass, *Koeleria macrantha*, has characteristics that could make it useful as a low-input turfgrass.
- Great diversity exists in public collections of *Koeleria macrantha*.
- Local collections will result in improved seed production characteristics.
- Integration of traits from diverse germplasm should be effective in the development of a low-input cultivar.

RELATED INFORMATION

<http://turf.lib.msu.edu/ressum/2007/38.pdf>

Dixon, J. M. 2000. *Koeleria macrantha* (Ledeb.) Schultes (K. *alpigena* Domin, K. *crinata* (L.) Pers. Pro parte, K. *gracilis* Pers., K. *albescens* auct. non DC.). *Journal of Ecology*, 88:709-726.

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