Development of New Sustainable Turfgrass Species from the Genus *Danthonia*

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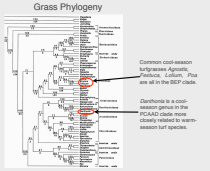
Introduction

Abstract
One way to improve the sustainability of cool-season turfgrasses is to identify and develop new species with low-input maintenance requirements. The genus *Danthonia* is comprised of more than 100 species that are primarily native to temperate regions of the southern hemisphere where they are important forage grasses. Approximately six species of *Danthonia* are native to the U.S with *Danthonia spicata* (poverty oatgrass) being the most widespread. *D. spicata* is a grayish-green mat forming species commonly found growing in dry, poor quality soils. The objective of this research is to explore the potential of *Danthonia* species as low maintenance turfgrasses and to determine the level of genetic diversity present in native collections of *Danthonia* from low maintenance turfgrass areas in the Northeast United States. Seed collections were made in the summer of 2006 and used to establish a seeding rate turf trial at the University of Maryland turfgrass research center. In addition, multiple turf maintained *Danthonia* plants from several different locations were collected in 2007 and 2008 and screened using 347 AFLP markers to determine the level of within and between location genetic variability. The results indicate that an acceptable *Danthonia* turf can be established utilizing seeding rates at or below 5.2 g/m^2. The diversity study indicates that *Danthonia* has limited within and between population variability; however, low levels of genetic diversity are maintained due to rare outcrossing events. Future studies will focus on determining an accurate estimate of outcrossing rates in *Danthonia* and if effective controlled crosses can be made.

Grass Phylogeny



Distribution

Danthonia spicata has been reported in every state in the U.S. except Utah, Nevada, California, and Hawaii. Green areas on the map indicate the species is present and considered a native.

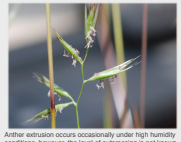
Danthonia Biology

Picture of native turf maintained *Danthonia spicata* at the National Arboretum in Washington D.C.

Established turf plot at the U. of Maryland turf center. This plot is part of a seeding rate study seeded at 5.2 g/m^2

Danthonia spicata produces two types of seed head. The seed head on the right is a typical terminal seed head and the seed head on the left is a cleistogamous seed head produced at the nodes of the flowering stem.

Cleistogamous seed is also produced at the base of the tiller often below the soil line.

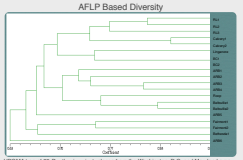


Anther extrusion occurs occasionally under high humidity conditions, however, the level of outcrossing is not known.

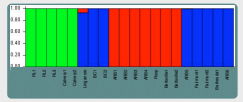
Some *Danthonia spicata* plants have an epiphyte *Atkinsonella hypoxylon* that can induce choke.

Results & Conclusions

AFLP Based Diversity



UPGMA tree of 20 *Danthonia spicata* clones from the Washington, D.C. and Maryland area based on 347 AFLP markers.



Conclusions

- Approximately 6 species in the genus *Danthonia* are native to the U.S. with *Danthonia spicata* being the most widespread.
- *Danthonia spicata* is capable of forming a respectable turf, at seeding rates below 5.2 g/m^2 with its most prominent characteristic being its tolerance of low fertility soils.
- *Danthonia spicata* reproduces through two types of seed heads. Terminal seed heads can be outcrossing while nodal seed heads are completely self-fertile.
- *Danthonia spicata* is often found associated with a choke forming epiphyte *Atkinsonella hypoxylon*.
- Diversity analysis with AFLP markers indicate that genetic diversity is present at moderate levels, however, plants from different populations can be distinguished.
- Intercrossing of clones from different locations may lead to hybrid vigor.

Future Research

- Outcrossing rates will be estimated using AFLP markers and multilocus outcrossing analysis in halfsib families.
- Controlled crossing between turf-type genotypes collected form different locations will be attempted to determine if hybrid vigor is present.
- Seed shatter is a problem and efforts to identify germplasm with reduced shatter will be continued.