

# Evaluation of the New England Velvet Bentgrass Collection

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## Objectives:

1. Collect velvet bentgrass (*Agrostis canina* L.) germplasm accessions.
2. Identify and group accessions based on their genetic similarities for analysis and breeding.
3. Evaluate accessions for improved resistance to biotic and abiotic stresses.

**Start Date:** 2007

**Project Duration:** three years

**Total Funding:** \$90,217

The New England velvet bentgrass germplasm collection is a collaborative effort by researchers at the University of Rhode Island and the University of Massachusetts. More than 250 accessions have been collected from old golf courses throughout New England. In 2009, the entire collection was evaluated for salt tolerance in the greenhouse at URI, and for genetic color, growth rate, and dollar spot in the field at URI. Copper spot resistant accessions identified in 2008 were re-screened to confirm resistance.

Velvet bentgrass (*Agrostis canina*) has two ploidy levels, diploid ( $2n=14$ ) and tetraploid ( $2n=28$ ) referred to subsp. *canina* and subsp. *montana*. A flow cytometry analysis was carried out in the velvet bentgrass collection to clarify the ploidy level of the accessions. After the analysis, 74% (159 individuals) of the accessions were found diploid supported with velvet phenotypes and 26% (56 individuals) were found tetraploid. Out of 83 EST-SSR primers previously screened, 10 pairs were selected because of their polymorphism and quality of amplification.

Velvet bentgrass has excellent tolerance to lower levels of sunlight, nitrogen, and water. Velvet bentgrass is consid-

ered native to New England and coastal regions as far south as Maryland. The stress tolerance genes found in velvet bentgrass need to be preserved as potentially irreplaceable genetic resources.

The entire collection was evaluated for salt tolerance in the greenhouse at URI from February until June 2009. Three clones of each accession were transferred to pots filled with sand and placed in an ebb-and-flow hydroponics system. The plants were irrigated with a nutrient solution amended with sodium chloride. The salt concentration was increased every two weeks from 1,000 ppm to 8,000 ppm.

At the end of each two-week period, all the plants were photographed using a digital camera and a portable light box. SigmaScan software was used to measure retention of green foliage by calculating the number of green pixels in each image. At 8,000 ppm salt, 'SR7200' retained 4% green cover, and 'Greenwich' retained 10%. The velvet bentgrass accessions ranged from 0% green cover to 80% cover. Thirty-nine accessions were significantly more salt tolerant than either cultivar, and an additional seven were more tolerant than 'SR7200'. Thirty-one of these accessions retained more than 50% green cover.

Three replications of the germplasm collection were established in the field at URI as spaced-plants on 18-inch centers and mowed at fairway height. This field trial is being used to evaluate genetic color, turf growth, and disease



Planting the collection in the field at URI. The collection was plugged into an established chewings fescue turf to suppress weeds and facilitate mowing at fairway height.

resistance. Each accession was photographed in September 2008 and July and November 2009 using a digital camera and controlled lighting. The digital green color index has been calculated for each accession, producing quantitative data for color comparisons.

The collection was transplanted to the field in June 2008 as 5.5-cm plugs. Holes were cut into an established chewings fescue turf using a standard cup cutter, so each plug was surrounded by a 2.6 cm-wide ring of bare soil. The diameter of each plant was measured in July 2009. Four accessions failed to survive. Diameters for the others ranged from 6 cm to 23 cm. Most of the accessions more than doubled in size; 42 accessions more than tripled in size despite competition from the chewings fescue.

The field trial was visually evaluated for dollar spot resistance in August 2009 following a severe natural disease outbreak. Accessions were rated from 1-9, with 9 indicating no disease. Eighty-seven out of 233 accessions (37%) showed no sign of disease.

## Summary Points

- Collaborative studies continue with several researchers in New England.
- Significant progress has been made to identify germplasm that have enhanced resistance to biotic and abiotic stresses.



Velvet bentgrass genotype showing brown patch resistance in natural conditions at UMass research plot, S. Deerfield MA.