Cultivar Development and Extreme Temperature Tolerance of Greens-type Poa annua

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Objectives:

1. Collect, select, breed, and develop genetically stable and phenotypically uniform cultivars of greens-type *Poa annua* for commercial production.
2. Develop techniques to screen large numbers of germplasm accessions for tolerance to extreme temperatures and coverage by sheets of ice.
3. Identify genetic markers associated with genetic loci (genes) controlling agronomically important traits and specific stress tolerances to aid in the breeding and development of improved cultivars of greens-type *Poa annua*.

Start Date: 1998
Project Duration: 5 years
Total Funding: $175,000

The purpose of this research is not to replace creeping bentgrass as a putting surface, but rather to offer an alternative grass to those golf courses where *Poa annua* L. is simply a better choice. The main focus of this project is to develop commercial seed sources of uniform and stable cultivars of greens-type *P. annua*.

This developmental process began by collecting thousands of samples of greens-type *P. annua* from existing golf course putting greens. Most samples were collected from courses located in North America (primarily in the northeast, mid-Atlantic, and Pacific Northwest regions), but we also have samples from Europe, Australia, and New Zealand. Seed produced by these samples are evaluated for uniformity and stability in the breeding nurseries and eventually superior strains were identified and established in turf plots maintained at greens height of cut.

Currently, we have a total of three putting green quality evaluation trials at Penn State. These trials demonstrate that most cultivars in the breeding program are capable of being successfully established and maintained on sand-based rootzones and that several cultivars have superior turf quality.

Differences among cultivars continue to be observed for resistance to naturally occurring dollar spot disease and anthracnose disease. A susceptible and several resistant cultivars have been identified for a strain of anthracnose. Isolates of this strain of *Colletotrichum graminicola* (Cesati) Wilson were collected and will provide a basis for investigating the underlying genetic mechanism of resistance in *P. annua*.

Annual bluegrass is a highly variable species. Most samples were collected from courses located in North America (primarily in the northeast, mid-Atlantic, and Pacific northwest regions), but samples were also collected from Europe, Australia, and New Zealand.

In addition, turf plot evaluations of our most promising cultivars are being performed by other researchers in California, New Jersey, New York, Washington, Oregon, and Australia. In Australia, we recently observed enhanced tolerance to salinity and drought stress.

We are currently utilizing molecular genetic tools including genetic markers, flow cytometry, and micro-array analysis to further our understanding of the genetic basis underlying the evolution of these biotic and abiotic stress tolerances in greens-type *P. annua*. We are also currently establishing a seed production field in Oregon to begin evaluations for commercial seed production of our most elite cultivars.

Summary Points

- Differences among cultivars continue to be observed for resistance to naturally occurring dollar spot disease and anthracnose disease.
- Turf plot evaluations of our most promising cultivars are being performed by other researchers in California, New Jersey, New York, Washington, Oregon, and Australia
- A seed production field in Oregon has been established to begin evaluations for commercial seed production of the most elite cultivars.
- Molecular genetic tools are being used to understand the genetic basis underlying the evolution of these biotic and abiotic stress tolerances in greens-type *P. annua* cultivars.