Breeding and Evaluation of Kentucky Bluegrass, Tall Fescue, Perennial Ryegrass, and Bentgrass for Turf

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Objectives:

1. Collect and evaluate potentially useful turfgrass germplasm and associated endophytes.
2. Continue population improvement programs to develop improved cool-season turfgrass cultivars and breeding synthetics.
3. Develop and utilize advanced technologies to make current breeding programs more effective.

Start Date: 1982
Project Duration: Continuous
Total Funding: $10,000 per year

As of Sept. 28, 2004, over 2,650 promising turfgrasses and associated endophytes were collected from Lithuania, Latvia, Finland, Uzbekistan, Kyrgystan, and the United States. Over 10,000 new turfgrass evaluation plots, 68,200 plants in spaced-plant nurseries, and mowed single-clone selections were established in 2004.

Over 250,000 seedlings from intraspecific and interspecific crosses of Kentucky bluegrass were screened for promising hybrids under winter greenhouse conditions of short daylenghts and cool temperatures. 100,000 tall fescue seedlings were screened for rhizomes, 58,000 European perennial ryegrass seedlings were screened for superior turf-types, progenies of 1,850 bluegrass hybrids were examined for apomictic reproduction, and over 12,000 bentgrasses and 5,000 fine fescue seedlings were also screened for better turf characteristics and disease resistance.

The best perennial ryegrass progenies with genetic resistance to gray leaf spot caused by *Pyricularia grisea* in 2,000, 2001, and 2002 tests continue to perform well in tests seeded in August, 2003 and 2004. Extensive tests were established in 2004 to continue this breeding and evaluation program. Resistance to gray leaf spot is coming largely from new germplasm collections from eastern Europe, but also from our long-term germplasm collection and population improvement program. The turfgrass seed industry and users are showing great interest in the best gray leafspot resistant perennial ryegrasses.

Newer, lower-growing tall fescues are showing significant improvements in shade tolerance under closely spaced pecan trees.

Poa angustifolia shows potential as a low-maintenance turfgrass and as a parent in crosses with Kentucky bluegrass. Expanded efforts are directed to obtaining additional collections of this species from old turfs in Europe, North America, and Asia. Continued progress is being achieved in the development of Kentucky bluegrass x Texas bluegrass hybrids with improved tolerance of heat and drought as well as improved seed production, establishment characteristics, and resistance to dollar spot disease caused by *Sclerotinia homoecarpa.*

Some newer, lower-growing tall fescues are showing significant improvements in shade tolerance under closely spaced pecan trees. A lower growth profile, resistance to etiolation under reduced light intensity, good vigor, and high resistance to powdery mildews and leafspots are significant factors in breeding for better shade tolerance.

New synthetic cultivars of tall fescue were developed from large populations of plants selected from the best performing single-plant progenies in closely mowed turf trials and evaluated as frequently mowed, inoculated spaced-plants. They show significant improvements in resistance to brown patch disease caused by *Rhizoctonia solani*, as well as overall improvements in turf performance.

Significant progress is being made in the discovery, enhancement, and utilization of new sources of resistance to dollar spot in creeping bentgrass and colonial bentgrass and brown patch and root *Pythium* in velvet bentgrass.

Considerable variation in wear tolerance continues to be observed in turf trials of Kentucky bluegrass. 'Cabernet' and 'Wabash' types with excellent heat-tolerance showed excellent resistance to wear under summer stress. 'Princeton P-105', 'Julia', 'Midnight' and the best new 'Midnight' types performed well in a closely mowed, season-long test.

Summary Points

- Continued efforts to obtain new sources of turfgrass and endophyte germplasm from previously under explored regions is contributing to programs to enhance stress tolerance, growth characteristics, and resistance to insect pests and diseases.
- Modified population backcrossing and continued cycles of phenotypic and genotypic selection combined with increasing sources of genetic diversity in turfgrass germplasm and beneficial endophytes enables significant improvements in performance of new cultivars.
- Substantial progress is being achieved in the genetic improvement of Kentucky bluegrass (*Poa pratensis*) using intraspecific hybridization, interspecific hybridization with Texas bluegrass (*P. arachnifera*) and *P. angustifolia*, somoclonal mutation using media supplemented with NaCl, and genetic transformation.
- Over 4,000 spaced-plants of creeping, velvet, and colonial bentgrasses from new germplasm collections were established to identify new sources of genetic resistance to dollar spot and brown patch. Our best experimental creeping bentgrasses were able to maintain very good turf quality with an 80-90% reduction in fungicides.