

Breeding and Evaluation of Kentucky Bluegrass, Perennial Ryegrass, Tall Fescue, Colonial Bentgrass, Creeping Bentgrass, Dryland Bentgrass, Velvet Bentgrass, Strong Creeping Red Fescue, Chewings Fescue, Hard Fescue, Blue Fescue, Koelaria spp., Decampsia spp. and Texas Bluegrass X Kentucky Bluegrass Hybrids for Turf

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1. Promising germplasm of turfgrasses and *Neotyphodium* endophytes were collected from Bulgaria, Poland, the Slovic Republic, Inner Mongolia, Uzbekistan, and the United States. This included a number of endophyte-containing bentgrasses with a very small percentage of panicles showing choke stroma.

2. Germplasm collections and current turf trials indicate opportunities for substantial genetic improvements in a number of grass species which have received limited attention in turfgrass breeding programs in the United States. These include velvet bentgrass, colonial bentgrass, dryland bentgrass, *Koelaria* spp., *Deschampsia* spp. and interspecific hybrids between Texas bluegrass and Kentucky bluegrass. We are also seeing continued genetic improvement in perennial ryegrass, turf-type tall fescue, fine fescues, creeping bentgrass, and Kentucky bluegrass.

3. Broad sense heritability of dollar spot resistance in creeping bentgrass is being studied through the evaluation of 500 creeping bentgrass clones replicated six times in two environments. This study was initiated in May of 1998 at the Horticultural Farm II located on Ryders Lane in North Brunswick, NJ. The clones were heavily inoculated with the dollar spot pathogen (*Sclerotinia homeocarpa*) using infested Kentucky bluegrass seed in July of 1998. These clones were evaluated for resistance to dollar spot throughout the summer and into the fall of 1998. Initial results indicate that only 8 out of 500 clones show high levels of resistance to dollar spot disease.

4. Nearly 11,000 new turfgrass evaluation plots were seeded in field trials at Adelphia, North Brunswick, and Pittstown New Jersey. They included 4,500 plots of Kentucky bluegrass, 1,890 plots of fine fescues, 1,750 plots of tall fescue, 1,700 plots of perennial ryegrass, and 1,040 plots of bentgrass. These tests will be evaluated for a number of years for establishment vigor, turf quality, pest resistance, stress tolerance, texture, density, vertical growth rate, and persistence.

5. Approximately 100,000 plants were added to our spaced-plant nurseries for selection of promising clones, evaluation of seed yield, disease resistance, growth characteristics, stress tolerance, and breeding behavior. An additional 25,000 seedlings were established in mowed, clonal evaluation trials. These came from promising breeding lines of perennial ryegrasses, fine fescues, *Deschampsia* spp. and *Koelaria* spp.

6. Research is currently underway to identify and characterize microsatellites in perennial ryegrass. These molecular markers are short DNA sequences that contain short di or tri nucleotide repeats that are randomly dispersed throughout the genome in most organisms. Their abundance makes them particularly useful for DNA fingerprinting which can aid in cultivar identification and ultimately cultivar protection. Microsatellites can also be useful for population genetics studies and for marker assisted breeding. Twelve polymorphic or variable microsatellite loci have been identified and used to study ryegrass cultivars, clones and other species within the genus *Lolium*. We find these markers provide reasonable insights into genetic relationships and are excellent for cultivar identification in perennial ryegrass. Seventy-five more potentially useful microsatellite loci that have been identified but need to be investigated further to determine if they are polymorphic. Since 20 to 30 polymorphic or variable loci are ideal for precise cultivar identification and chromosome mapping, future studies will concentrate on identifying more of these loci in perennial ryegrass.

7. We participated in the development of a number of new turfgrass cultivars. These included Jefferson, Champagne, Cache, Moonlight, Dragon, Blackstone, H94-301, SR-2100 and SR-2109 Kentucky bluegrasses; Brightstar II, Calypso II, Monterey, Panther, Prelude III, Prizm, Catalina, Windstar, Exacta, Churchill, and Paragon perennial ryegrasses; Shadow II, Ambassador, Victory II, and Tiffany Chewings fescues; Oxford and Nordic hard fescues; Flyer II, Trapeze, Pathfinder, Fenway and Audubon strong creeping red fescues; and Rembrandt, Renegade, Picasso, Masterpiece, Wolfpack, Plantation, Millennium, and Shenandoah II tall fescues.

8. Field trials of transgenic creeping bentgrass have been established to evaluate promising transformed genes for herbicide resistance, stress tolerance, and pest resistance. Crosses have been made to initiate population backcrossing and recurrent selection programs to incorporate these genes into elite varieties and breeding synthetics. Work is progressing on the transformation of other turfgrass species.

9. We continue to make crosses of elite Kentucky bluegrass parents and screen large numbers of seedlings for promising hybrids under greenhouse conditions and in spaced-plant field nurseries.