

Breeding and Evaluation of Cold-tolerant Bermudagrass Varieties Golf Courses

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Goals:

- *Assemble, evaluate, and maintain Cynodon germplasm with potential for contributing to the genetic improvement of the species for turf.*
- *Improve bermudagrass germplasm populations for seed production potential, cold tolerance, and other traits conditioning turf performance.*
- *Develop, evaluate and release superior seed-propagated, cold-tolerant, fine-textured, turf bermudagrass varieties for the U.S. transition zone and similar climates.*
- *Develop, evaluate and release improved vegetatively propagated bermudagrass varieties with specific adaptations and uses in the southern U.S., e.g. varieties for golf course putting greens in the deep South.*

Cooperators:

*James Baird
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The turf bermudagrass breeding program was initiated in 1986 at Oklahoma State University. The initial broad objective was to develop fine-textured, winter-hardy, seed-propagated varieties for the U.S. transition zone. The program was expanded in 1990 to include the development of superior vegetatively-propagated varieties.

The turf bermudagrass breeding program at Oklahoma State University is a team effort among scientists in stress physiology, molecular biology, plant breeding, genetics, and turfgrass management aimed at developing superior, fine-textured, cold-tolerant, seed- and vegetatively-propagated varieties.

Molecular research has led to the identification of differentially expressed mRNA's in Midiron control and cold-acclimated plants. Investigations of genetic relatedness of *Cynodon* taxa were also initiated this year. Polymerase chain reaction technology is being employed to assess DNA composition in plant materials.

Additional detail was prepared in a manuscript titled: "Molecular Identification Of Cold Acclimation Genes In, and Phylogenetic Relationships Among, *Cynodon* Species." A flow cytometry protocol was developed for bermudagrass, and nuclear DNA contents were determined for four cytotypes. Details were described in a manuscript titled: "Use of Flow Cytometry to Estimate Ploidy Level in *Cynodon* Species." Two experimental synthetic varieties have performed well in comparison to other seed-propagated varieties in various field tests. OKS 91-11 has consistently

ranked high in turf quality and cold hardiness in the 1992 National Turfgrass Evaluation Program test and in a field evaluation with JACKPOT and MIGRAGE seeded bermudagrasses at OSU. OKS 91-11 exhibited exceptional turf quality at both 0.5 and 1.5-inch mowing heights. Both seedling and mature stands of OKS 91-11 are tolerant to commonly-used postemergence herbicides. The formal release of OKS 91-11 will proceed during the winter of 1996-97. Seed companies in Oklahoma, Oregon, and Arizona have expressed interest in the variety.

OKS (BERPC) 91-3 has performed well in tests conducted in Georgia in terms of turf quality and stand persistence. A decision on release of OKS 91-3 will be delayed until 1997 to permit further evaluation and increase of basic propagating stock.

Three bermudagrasses collected from the Peoples Republic of China in 1993 demonstrated very good turf quality and reasonably high fertility in preliminary evaluations. Further evaluations will continue next year.

Tolerance to Spring Dead Spot (SDS) disease has been evaluated for several seed- and vegetatively-propagated bermudagrasses and a manuscript describing this research has been prepared. Additional bermudagrass selections were inoculated with a causal organism of SDS for evaluation in upcoming years.

Cynodon transvaalensis selections made over the past 5 years have provided new and valuable germplasm within this species to use both in intraspecific and inter-specific breeding. F₁ hybrid plants from interspecific crosses have been

identified which have good turf quality characteristics. These plants are being expanded for further evaluation and potential release in the future. Some interspecific hybrid plants are cytogenetically unique and are proving valuable as parents in breeding.

Fifteen *C. transvaalensis* plants selected from screening nurseries over the past four years were planted in an isolated polycross in 1996. Polycross seed will be used to produce a new population for further selection. We are also considering a formal release of the resultant population as a germplasm since the *C. transvaalensis* germplasm base in collections in the USA and worldwide is very narrow.

A *C. transvaalensis* genetic population was field planted in 1996 to study genetic variation within the species. Management studies have revealed that *C. transvaalensis*: 1) responds to higher fertility levels, especially nitrogen; 2) is sensitive to higher rates of Dimension, Ronstar, and hormone-type herbicides when mowed at putting green cutting heights; 3) possesses an upright growth habit which results in less ball roll and susceptibility to scalping injury; 4) requires frequent topdressing and vertical mowing for maximum turf quality; 5) transitions out of dormancy faster than other bermudagrass species; 6) is severely weakened by winter overseeding; 7) undergoes an unexplainable period of decline during the summer; 8) possesses exceptional winter hardiness and tolerance to SDS; 9) looks best in terms of turf quality in the spring and fall; and 10) has potential for use on golf course putting greens, tees, and fairways.