

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.

The objectives of the Oklahoma State University bermudagrass breeding program are to develop improved seed and vegetatively propagated varieties for use in the transition zone and southern states.

Phenotypic recurrent selection (PRS) is continuing in two broad genetic base *C. dactylon* populations, one derived from cold-tolerant, relatively infertile germplasm, the other from cold-sensitive, highly fertile germplasm. Selection within the cold-tolerant populations, C_{3fer3tex} has been for increased seed production potential and finer texture. Selection within the cold-sensitive population (C_{2ct}) has been for increased freeze tolerance. An additional cycle of selection was completed within each of the populations over the past year.

The C_{3fer3tex} population and synthetic varieties derived from it have demonstrated good cold tolerance and turf quality in multi-environment tests. The seeded experimental OKS 91-11 has performed well in the National Turfgrass Evaluation Program bermudagrass test. Scale-up production has been initiated for two synthetic varieties in preparation for commercialization.

Research with African bermudagrass, *C. transvaalensis*, has demonstrated extensive phenotypic variation within the species for many traits influencing adaptation and turf quality. Development of a genetic population was completed that will permit estimation of genetic parameters within the species. Field evaluation of selected African genotypes indicate their major weaknesses to be instability of turf quality and light-green color. In tropical environments, the African selections maintain good to excellent putting-green turf in winter, but dramatically decline in quality during summer.

The decline is less severe in temperate environments.

Alterations in protein synthesis associated with cold acclimation have been documented in MIDIRON and TIFGREEN bermudagrasses. MIDIRON crowns synthesized low molecular weight basic cold-regulated

(COR) proteins in greater numbers and amounts, and intermediate molecular weight acidic COR proteins in greater amounts than TIFGREEN crowns. Peptide sequence analysis of a prominent low molecular weight protein from MIDIRON crowns indicates it to likely be a chitinase.

Mean Turfgrass Quality Ratings of Bermudagrass Cultivars for Each Month Grown at Twenty-Three Locations in the United States. 1994 Data.²

NAME	Turfgrass Quality Ratings 1 - 9; 9 = Ideal Turf: Months ¹												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
TDS-BM1	5.0	4.4	5.5	5.6	6.1	6.0	6.4	6.3	6.5	6.6	6.3	4.1	6.0
MIDLAWN	4.9	4.6	4.9	5.0	6.0	5.6	5.9	6.2	5.9	5.8	5.5	3.4	5.9
MIDFIELD	5.0	4.4	5.1	4.7	6.1	5.8	5.9	6.0	6.0	5.8	5.4	3.6	5.8
MIDIRON	5.1	4.2	5.3	5.0	5.8	5.6	6.1	6.3	5.9	5.5	6.0	4.3	5.8
TIFGREEN	5.2	4.8	5.2	5.1	5.7	5.6	6.0	6.0	6.2	6.4	6.3	4.2	5.8
TIFWAY	5.4	4.3	5.4	5.0	5.6	5.7	6.2	6.2	6.2	6.4	6.4	4.4	5.7
MIRAGE (90173)	5.3	4.1	4.3	4.4	5.3	4.9	5.5	5.7	5.5	5.8	5.6	3.7	5.3
TEXTURF 10	5.1	4.2	5.1	5.0	5.1	5.4	5.7	5.7	5.8	5.9	5.9	3.8	5.3
OKS 91-11	5.1	4.4	4.5	4.5	5.5	5.0	5.4	5.7	5.3	5.5	5.3	3.7	5.3
STF-1	4.9	4.3	5.0	4.7	5.2	5.1	5.5	5.6	5.5	5.6	5.5	4.1	5.3
J-27	5.0	4.2	4.1	4.1	5.4	5.1	5.4	5.4	5.1	5.3	5.2	3.4	5.1
GUYMON	5.2	3.9	4.5	4.3	5.4	5.0	5.1	5.4	5.2	5.3	5.1	3.4	5.1
JACKPOT (J-912)	4.2	4.1	4.4	4.0	4.6	4.6	5.2	5.3	5.2	5.4	5.4	3.6	4.8
SUNDEVIL	4.9	3.7	3.9	3.7	4.5	4.2	4.8	5.0	5.0	5.4	5.4	3.7	4.7
FMC 5-91	5.0	4.0	4.1	3.9	4.4	4.2	4.9	4.9	5.0	5.4	5.3	3.7	4.6
FMC 6-91	5.1	4.1	4.0	3.9	4.3	4.2	4.8	5.0	4.9	5.4	5.5	3.7	4.5
OKS 91-1	5.3	4.1	3.8	3.6	4.2	4.0	4.5	4.8	4.8	5.2	5.3	3.5	4.4
FHB-135	4.6	3.9	4.7	4.2	4.1	4.4	4.7	4.5	4.5	5.1	6.1	4.2	4.3
FMC 2-90	4.9	3.7	4.1	4.1	4.2	4.1	4.5	4.7	4.8	5.2	5.3	3.8	4.3
FMC 3-91	4.9	4.1	4.1	3.9	4.1	4.0	4.4	4.7	4.7	5.2	5.5	3.7	4.3
SAHARA	5.1	4.1	4.3	4.0	4.2	4.0	4.5	4.7	4.8	5.2	5.3	3.5	4.3
CHEYENNE	5.0	3.7	3.9	3.8	4.0	4.0	4.4	4.7	4.5	5.0	5.1	3.6	4.2
SONESTA	5.3	4.1	4.1	3.9	4.1	3.8	4.3	4.4	4.3	5.0	5.4	3.4	4.1
PRIMAVERA (FMC 1-90)	5.0	3.6	3.9	3.7	3.9	3.7	4.1	4.3	4.3	5.0	5.3	3.5	3.9
AZ. COMMON -SEED	5.1	3.6	3.7	3.6	4.0	3.7	4.0	4.2	4.4	4.8	5.1	3.4	3.9
AZ. COMMON-VEG.	4.6	3.8	3.3	3.2	3.3	3.6	3.9	4.2	4.2	4.6	4.8	3.3	3.8
LSD VALUE	1.1	0.6	1.4	1.1	0.7	0.8	0.7	0.7	0.7	0.7	0.7	1.1	0.6

¹ To determine statistical differences among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD Value (LSD 0.05).

² Source: National Turfgrass Evaluation Program. National Bermudagrass Test - 1993.