

# Freeze-tolerance Evaluation of Turf Bermudagrasses

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## Objectives:

1. Quantify freeze tolerance of advanced lines, recently released cultivars, and established bermudagrass standards using laboratory-based methodology.

Start Date: 2003

Project Duration: three years

Total Funding: \$30,000

**B**ermudagrasses grown in the transition zone for warm- and cool-season turfgrasses are susceptible to winterkill, resulting in loss of use and substantial costs in re-establishment. Breeding efforts, including classical crossing, induction of mutations, and genetic engineering, require a rapid and reproducible means to quantitatively evaluate freeze tolerance.

Although test winters can provide an excellent indication of winter survivability, their occurrence is unpredictable and not reproducible. Therefore, we are quantifying freeze tolerance of advanced lines, recently released cultivars, and established standards using laboratory-based methodology. This approach has been refined and used successfully to characterize turf bermudagrass freeze tolerance with results corresponding with field observations of winterkill.

One intention of the project is to align evaluated cultivars with those in the 2002 National Turfgrass Evaluation Program (NTEP) bermudagrass trial to the extent possible. To this end, experiments were divided into vegetative and seed-propagated cultivars. Permission to use material was obtained from seven of eight sponsors of seed-propagated cultivars and from all sponsors of vegetatively propagated cultivars. Due to space limitations, experiments with seeded bermudagrasses were divided into five groups. Each group contained five randomly selected entries and two standards ('Arizona Common' and 'Riviera'), allowing limited comparisons across groups. Vegetatively propagated cultivars have been divided into three groups with 'Midlawn' and 'Tifway' included in each group as standards.

Plants are established in Cone-tainers in a growth chamber using approximately 50 mg seed per Cone-tainer for seed-propagated cultivars, and phytomers from turf established in pots for vegetative-



Freeze tolerance is being evaluated as regrowth following low temperature exposure.

ly propagated cultivars. Following establishment at 32/28°C, plants were transferred to another growth chamber at 24/20°C for one week before acclimation at 8/2° C for 4 weeks. Cone-tainers were then placed into a freeze chamber for low temperature exposure. Four cone-tainers from each cultivar are removed at each test temperature. Following thawing, plant response to freezing stress is evaluated as regrowth. Visual observations of regrowth was recorded for five weeks, then top-growth was harvested and weighed. Data is reported as the midpoint ( $T_{MID}$ ) of the sigmoidal temperature versus survival and temperature versus mass of regrowth response curves.

Experiments involving seed-propagated bermudagrasses have been completed. The standards chosen for the seeded cultivars, 'Arizona Common' and 'Riviera', had freeze tolerance levels based on survival of -6.0°C and -7.6°C, respectively, averaged over the five groups. Values were slightly warmer, ('Arizona Common' = -5.7°C and 'Riviera' = -7.4°C) when  $T_{MID}$  was based on fresh weight of survivors, reflecting vigor of regrowth after low temperature stress. 'Riviera' was significantly more freeze tolerant than 'Arizona Common' in all experiments. Twenty-two out of 25 seed-propagated entries from the 2002 NTEP bermudagrass

trial had freeze-tolerance levels similar to 'Arizona Common', but none were significantly less hardy. In addition to 'Riviera', SWI-1014, 'Transcontinental', and CIS-CD6 exhibited significantly greater freeze tolerance than 'Arizona Common'.

Freeze-tolerance evaluations of the first group of vegetative entries have been completed. 'Celebration' (-6.6°C) was the least freeze tolerant, and OKC 70-18 (-11.5°C) exhibited the greatest freeze tolerance from this group. 'Midlawn' (-9.1°C) was less tolerant than OKC 70-18, but significantly hardier than all other cultivars. 'Aussie Green' (-8.2°C), 'Tift #3' (-7.6°C), and 'Tifway' (-7.7°C) formed a group of intermediate hardiness. Although many factors in addition to freeze tolerance will be assessed, cultivar choices are now available with freeze tolerance suitable for areas of the transition zone requiring superior winter hardiness.

## Summary Points

● Seed-propagated bermudagrasses exhibited a range in freeze tolerance from -5.3°C to -8.7°C. CIS-CD6, 'Riviera', 'Transcontinental', and SWI-1014 were the most freeze-tolerant seeded bermudagrasses.

● Freeze-tolerance evaluations of vegetatively propagated cultivars are ongoing. OKC 70-18 was the most hardy with a freeze tolerance of -11.5°C.