

# Breeding for the Future

High-quality seeded bermudagrass is now a reality in the transition zone.

BY DARIN S. BEVARD

The development of new turfgrasses for use on golf courses will continue to be an important part of golf course management in the future. Turfgrass breeding efforts are a major component of the USGA's Turfgrass and Environmental Research Program. The breeding program aims to develop improved turfgrass cultivars that will better tolerate environmental stresses such as heat, extreme cold, poor soil quality, and disease and other pests. These grasses may ultimately decrease reliance on pesticides, help conserve water resources, and still provide acceptable turfgrass quality for golf course use.

The contributions of the USGA during turfgrass development often go unnoticed when improved turfgrass varieties and new turfgrass species for the golf course enter the marketplace. The development and origin of experimental turfgrass varieties are often forgotten once trade names are applied. Well-known creeping bentgrass varieties such as Pennncross, Crenshaw, Cato, Pennlinks, and Providence received varying degrees of funding from the USGA during their development. In more recent years, breeding efforts of less traditional grasses such as buffalo-grass, seashore paspalum, saltgrass, and annual bluegrass have been supported by the USGA. Initial research on



Sodding is often the only choice to fix damaged areas when isolated winterkill of bermudagrass occurs. These areas, sodded the previous spring, illustrate the faster spring green-up of improved bermudagrass varieties compared to the surrounding common bermudagrass.

Riviera seeded bermudagrass exhibited excellent cold tolerance and quality in National Turfgrass Evaluation Program (NTEP) evaluations. This plot of Riviera continued to perform well in the Washington, D.C., area while surrounding varieties succumbed to winter damage.



Recently released seeded bermudagrasses have performed as well or better in the transition zone compared to commonly used vegetative varieties with respect to winter survival and spring green-up.



**Table 1**  
Freeze tolerance of turf bermudagrasses.  $T_{mid}$  values represent the midpoints of survival-temperature response curves.

Cultivar	$T_{mid}$
	°F
Princess	19.6a†
Tifway	17.8b
Tifsport	17.8b
Riviera	17.1bc
U-3	16.0cd
Patriot	14.5de
Midlawn	13.5e

†Means of four repetitions are separated by Duncan's New Multiple Range Test at  $P \leq 0.05$ .

Source: Jeffrey A. Anderson, C. M. Taliaferro, and D. L. Martin. *Crop Science*, 2003, 43:973-977. Longer exposure durations increase freeze damage to turf bermudagrasses.

Roundup Ready creeping bentgrass also received significant USGA support.

One ongoing element of the breeding program is the effort to enhance bermudagrass cold tolerance. As a turfgrass species that uses less water when compared to cool-season grasses, enhancing bermudagrass cold tolerance allows it to be used further north in the United States. Breeding efforts include the genetic mapping of bermudagrass cultivars with a focus on cold tolerance. Research to quickly and accurately assess the cold tolerance of individual bermudagrass varieties in the laboratory is ongoing. A major success of these breeding efforts has been the development of high-quality seeded bermudagrass for use on golf course fairways and rough in the transition zone. The transition zone refers to the climatic area where both cool- and warm-season turfgrasses can be grown. There are times when weather extremes in the transition zone provide challenges for the management of both cool-season and warm-season grasses. Extremely cold winters or prolonged periods of ice cover can promote winterkill of warm-season grasses, while hot, humid summers provide tremendous stress for cool-season grasses.

In the past, seeded bermudagrasses have been unreliable for use in the

transition zone because of a lack of winter hardiness or acceptable quality, or both. Spring green-up also is a major concern for bermudagrass varieties in the transition zone. Rapid spring green-up can eliminate the need for perennial ryegrass overseeding on many golf courses. Limited seed production of high-quality bermudagrass cultivars also has provided challenges for their development.

Why seeded bermudagrasses? Reliable seeded bermudagrasses will provide turfgrass managers with more options for bermudagrass establishment in the transition zone. In the past, sprigging, row-planting, and sodding have been the only viable choices for bermudagrass establishment. One example of special concern occurs when small areas of bermudagrass succumb to winterkill. Reestablishment of small winter-killed areas is costly because sod generally must be used. Seeded bermudagrasses will provide the option of reseeding some of these isolated areas rather than resodding.

Since 1986, researchers at Oklahoma State University have been working to develop more cold-tolerant bermudagrasses, and seeded cultivars in particular. One promising commercial variety is Riviera (OKS 95-1). Riviera was licensed for commercial production in 2001 and

has been a top performer in overall quality in the NTEP bermudagrass trials established in 1997. Turfgrass quality ratings for Riviera met or exceeded the quality of all other entries. The quality and cold tolerance of Riviera is unsurpassed by any currently available seeded varieties and compares favorably to vegetative bermudagrass cultivars already used in the transition zone with respect to winter survival and spring green-up.

Dr. Charles Taliaferro from Oklahoma State University heads up efforts to improve cold hardiness of bermudagrass, and recently he was awarded the inaugural 2003 Breeders Cup from the Turfgrass Breeders Association. He was recognized for the development of Riviera and its breakthrough in cold tolerance, quality, and seed yield among bermudagrasses.

The USGA continues to support research to evaluate additional bermudagrass cultivars in hopes of providing even more improvement in seeded and vegetative varieties for cold tolerance and spring dead spot resistance. With regards to Riviera, research concerning tolerance to perennial ryegrass overseeding also is needed. While overseeding is not widespread in the transition zone, some golf courses implement this practice during the fall. To date, perennial ryegrass overseeding generally has a negative impact on the quality and survival of all bermudagrass varieties in the transition zone.

The USGA's breeding program continues to move forward in hopes of developing turfgrasses that provide acceptable playing conditions with reduced inputs of water and pesticides. As water restrictions and regulation of traditional pesticides increase, improved turfgrass varieties that perform well when these inputs are reduced will provide acceptable golf course conditions.

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