DESERT SALTGRASS:
A Potential New Turfgrass Species

Always on the lookout for new types of turfgrass, researchers may have found a promising species.

by DAVID M. KOPEC and KEN MARCUM

Saltgrass (Distichlis) *plots are being evaluated for turfgrass quality at Colorado State University. Buffalograsses* (Buchloe dactyloides) *are in the foreground and saltgrass selections are in the background. After many weeks of drought and no irrigation, the color differences are dramatic.*

THE PROBLEM of adequate water availability and water quality is among the greatest issues that turfgrass managers face in the western United States. Increased population growth nationwide, with a shift in population demographics to the southwestern United States has forced potable and well water use on golf courses to become stretched to the limit.

One way golf courses meet this challenge is to minimize the acreage allotted to turf. In Arizona, all new courses designed and constructed after 1985 are 90 acres or less of turf. Still, water costs can be one third of the annual operations budget. The use of reclaimed municipal wastewater is practiced wherever feasible. However, more needs to be done in the entire scheme for water conservation.

Bermudagrass is probably the toughest all-around turfgrass in the southern United States, with low water-use rates and fast growth being key assets. Even with its relatively low rate of water use, bermudagrass (as a turf in general) is often treated as an environmental taboo, especially in desert climates and other areas that receive low rainfall. Are there any other grasses that are water efficient and tolerant of poor quality water that can grow in the desert? The answer – maybe.

The University of Arizona has been evaluating an *unused* native grass species for turfgrass adaptation that is commonly referred to as saltgrass; the genus is *Distichlis*. It should not be confused with alkaligrass, a cool-season species that includes weeping alkaligrass (*Puccinellia distans*) and Lemmon alkaligrass (*Puccinellia lemmonii*). Those grasses are bunch-type grasses that grow in cooler climates. *Distichlis* is a warm-season grass that turns brown in the winter, like bermudagrass.

There are several species of *Distichlis* (saltgrass), but two types predominate. These are coastal saltgrass (*Distichlis spicata*) and inland or desert saltgrass (*Distichlis stricta*). Botanical literature often lists conflicting species and common names for these grasses.

Distichlis produces robust, scaly underground rhizomes, found at 4- to 10-inch depths in the soil. The growth is somewhat unique, as the rhizome tip will grow far away from the mother plant and then emerge at the soil surface. From that point, new vertical shoots "fill in" between the outermost rhizome and the mother plant. In that

regard, it is very different from other rhizomatous grasses, such as zoysiagrass, Kentucky bluegrass, or even bermudagrass.

The leaves of saltgrass and the plant itself show an appearance similar to a coarse bermudagrass. These leaves typically project from the stem at 65° to 75° from horizontal. The stems of some ecotypes can be very rigid and stiff to the touch, seemingly weedy enough to "give you splinters."

Unlike bermudagrass, *Distichlis* can be found in a wide array of geographic and climatic zones, such as: Yuma and the Wilcox Playa in the southern desert of Arizona; the Oregon coast; outside Denver, Colorado; the mountains of New Mexico; and Salt Lake City, Utah. *Distichlis* also is found on Sitting Bull Monument in northern South Dakota. Work being done at Colorado State University will help define the relationships between chromosome counts and geographic locations to see if different genotypes exist (as in buffalograss). This information will improve our understanding of the grass and expedite development of improved turf types.

So why would anyone bother investigating this species for potential use as a turfgrass? Because *Distichlis* will grow in very harsh soil conditions, endures extended drought, thrives in salty soil, and tolerates high-salt-content water.

Salinity-tolerance field trials were conducted at the University of Arizona greenhouse testing facilities, comparing all the *Distichlis* genotypes to a standard of Midiron bermudagrass. The highest salinity level tested was 60,000 ppm NaCl. For comparison, full-strength seawater is about 35,000 ppm. Figure 1 shows significant variability in the percentage of green leaf canopies of five saltgrass entries vs. Midiron bermudagrass. Midiron was essentially dead at 36,000 ppm. Some saltgrass entries were still mostly green at 60,000 ppm (e.g., A-55), but others did not perform as well (e.g., C-11). This illustrates not only the tremendous salinity tolerance of this species, but also the genetic diversity present – a positive factor for turf breeders in developing this species into a useful turfgrass.

Separating the Men from the Boys

In November of 1995, the University of Arizona embarked on a *Distichlis* "hunting trip" into Colorado. Hundreds of plants were collected from roadsides, an abandoned military air base, and old lawns. The collection was narrowed down to 100 plants (individual genotypes) based on their ability to propagate readily. Each of these 100 genotypes was cut into four pieces to make identical copies. Four hundred plants were then mowed with hand clippers at 1.75 inches three times a week for four months.

At a quick glance, Distichlis *can be mistaken for bermudagrass. This warm-season native grass species can be found in a wide array of geographic and climatic zones.*

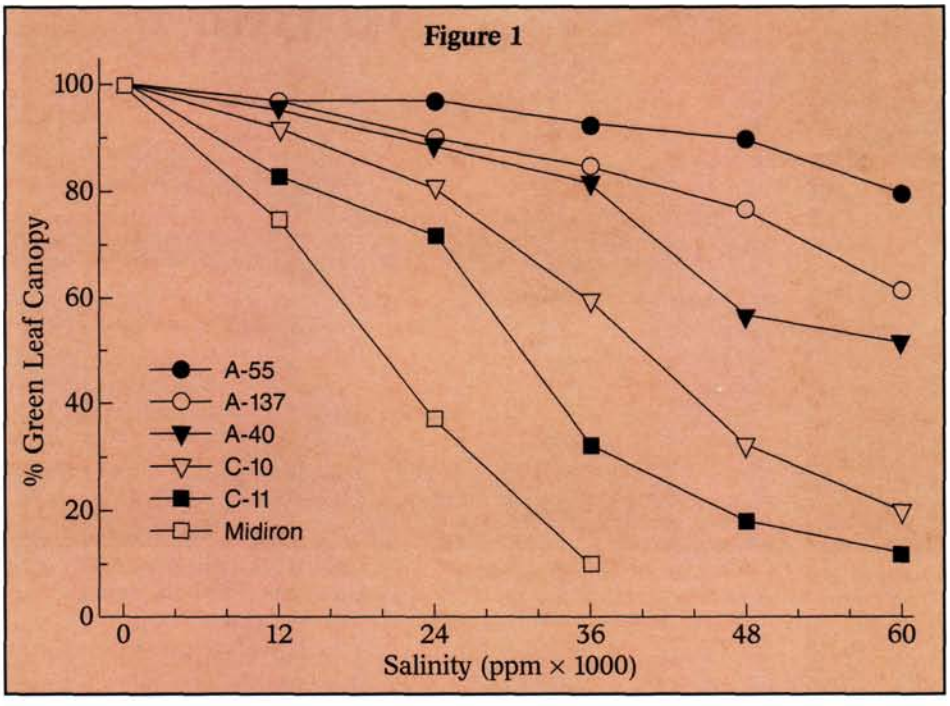
Plants that could tolerate the mowing stress filled up the pots almost completely and had high shoot densities and short leaf internodes (leaves are close together on the stem). Thus, mowing pressure demonstrated that (1) there was genetic variation in growth habit among the different plants collected and (2) the desirable turf-type growth habit was present in about 10% of the population. The test was repeated again a year later with the same plants emerging as "winners" in both tests.

Fourteen of the plants screened at the University of Arizona, along with seven from Colorado State University, have been planted as field plots. Turfs were established by placing three plants in the ground in 4 foot by 6 foot plots in August of 1998. Plywood frames were installed to provide sidewalls 24 inches deep in the soil. The frames were necessary to avoid plots from growing into one another due to the aggressive rhizome formation. Plots were mowed two to three times per week with a rotary mower at 2.0 inches.

In 1999, the turf received two spring flood irrigations. In 2000, the weather was extremely hot and dry, with less than 1.25 inches of rain from November 1999 to April 2000. Still, despite this minute amount of total water, most of the 21 entries greened up and held color. The plots were again flood-irrigated on April 11 and on May 13, 2000. Salt blocks (50 lb. animal-grade salt licks) were added to the irrigation plumes to add some stress and to help eliminate any surface weeds in the alleyways. Many of the *Distichlis* genotypes maintained green color from May 13 to June 15 under scorching temperatures of more than 100°F and arid, sunny conditions. In contrast, bermudagrass would last about a week under those conditions. From June 15 to September 1, the site received about 1.25 inches from five small rain events. The *Distichlis* did not receive any additional irrigation during that time. Under these types of field conditions we want to identify stress-hardy types that have an acceptable turf-type growth habit.

There are about five or six genotypes (single plant selections) that qualify as acceptable turf types. These plants have filled in the plots, maintained green color, have a high shoot density, and have stems with tips that are not sharp, mowed-off culms. Rather, there is a true leaf that unfurls from the stem, making for the best turf types.

Although not yet measured in tests, *Distichlis* also seems to adapt to traffic and compaction better than other warm-season grasses. *Distichlis* has been found growing on highly compacted sites, such as gravel roadways at truckstops and unpaved parking lots in Arizona and New Mexico. It remains to be seen how different selec-



tions, with different growth habits, respond to different kinds of compaction.

Since *Distichlis* is found in salty and droughty conditions where basically no other grasses grow, it probably is not a grass for areas that receive a significant amount of rainfall. However, geographical findings do support its existence from the low deserts to the high mountain areas. Casual observations of its many good characteristics warrant further investigation. It would be nice to have a grass that could go three to four weeks between irrigations, or even two weeks under heavy traffic. *Distichlis* may fit the bill.

What is in the Future?

Currently, the best turf types would be suitable for roughs, which are growing smaller in acreage on new golf courses due to water-use restrictions. No fairway types have been identified yet; however, two of the 21 entries in the existing test may tolerate closer mowing, perhaps to 7/8 inch. Further testing will be necessary.

As with any other new species, commercial propagation will be an important issue to resolve. *Distichlis* has some genetic limitations for seed production, but information from the studies at Colorado State University may help shed new knowledge on this subject. If not, then vegetative options will be investigated. *Distichlis* grows more slowly than bermudagrass, but more quickly than zoysiagrass. It *sleeps, creeps*, and then *leaps*, similar to buffalograss, when established by plugs. We have screened and maintained our selections under continuous mowing stress and devoid of water and fertilizer as much as possible. We are optimistic that *Distichlis* will be a tough grass for tough times. It takes a long time to develop a species into a new turfgrass, but *Distichlis* has shown the potential to be worth considerable effort.

Do you have any *Distichlis* on your golf course? If so, we would like to collect a sample. Contact Dr. David Kopec at dkopec@ag.arizona.edu, or call (520) 318-7142.

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One hundred genotypes of Distichlis *were clipped in pots to simulate mowing stress. Plants that could tolerate the mowing stress filled the pots almost completely.*