Better Turf Means Better Golf

The Bermudagrasses —Past, Present, and Future[1]

by DR. GLENN W. BURTON[2]

Bermudagrass is one of the world's most versatile turfgrasses. When properly managed it is able to withstand daily defoliation to a height of ¼ inch on the golf green, tolerate severe punsihment on the football field, or make a beautiful lawn.

Bermudagrass is a highly variable species that reproduces sexually. Members of the bermuadgrass genus *Cynodon* range in size from plants with pencil-sized stems that may reach a height of five feet to tiny fine-stemmed types that grow less than five inches tall. Common bermudagrass, *C. dactylon* (2n = 36), and African bermudagrass, *C. transvaalensis* (2n = 18), are the two species best suited for turf. Although generally considered a subtropical species, a clone collected in Berlin has survived in north Central Michigan and Canada. The tough, rapidly spreading stolons and rhizomes of bermudagrass make vegetative propagation practicable. All improved varieties are planted in this way. The bermudagrass seed produced in the United States is the common type and is produced largely in Arizona.

Past

The first bermudagrass golf greens were planted with seed of common bermudagrass. These greens demonstrated the pros and cons of common bermudagrass for golf greens. Disease, insects, and nematodes soon thinned stands so crabgrass and other weeds could invade the turf. Bermudagrass greens were overseeded with ryegrass in the fall to give a green putting surface in the winter. But when the ryegrass died in the spring, most greens were not green until the common bermuda could cover the bare spots left by the dead ryegrass. This was called the 'transition,' a period everyone accepted as another undesirable feature of bermudagrass for golf greens.

Golfers complained that bermudagrass greens were inferior to bentgrass greens in putting quality. But attempts to grow bentgrass on golf greens in the deep South failed and golfers reluctantly accepted bermudagrass greens. They had no other choice. Some admitted that bermuda greens offered excellent alibis for shots that missed the cup.

A few golf course superintendents (called greenkeepers in those days) observed small patches of better turf on some of their old greens. Several of these men, including Lester Hall, in Savannah, Ga., took up the turf from the best of these spots, increased it vegetatively, and used the increase to plant one or more greens.

U-3, from Lester Hall's golf course, was one of these that passed the tests in the USGA grass plots at Arlington, Va. It was propagated vegetatively on a number of golf courses and some football fields until it was replaced with the superior hybrid bermudagrasses. "No-mow," collected on the Mobile Country Club in the early 1960s, is another vegetatively propagated natural variant in common bermudagrass that proved superior to the turf generally obtained from seed.

Breeding bermudagrass for better turf began at Tifton, Ga., in 1942 when we crossed a very dense

Tifgreen stolons ready for planting.

[1] Cooperative investigations of the Agricultural Research Service, U.S. Department of Agriculture, and the University of Georgia, College of Agriculture Experiment Stations, Coastal Plain Station, Tifton, Ga.

[2] Research Geneticist, ARS, USDA, and the University of Georgia, College of Agriculture Experiment Stations, Coastal Plain Station, Tifton, Ga.

The bermudagrass breeding work of Dr. Burton, supported by the Green Section, has reached across the world. Here, Kapalua, Hawaii and tifdwarf.

drawf (from our pasture breeding research) with highly disease-resistant selections of common bermudagrass. The superiority of one of these hybrids (Tifton 57) was proven in 3 years of comparison with the best selections from a number of Southern golf courses in plots planted at Tifton in 1946. Characteristics sought in these grasses were dependability, good green color throughout the growing season, frost resistance, drought tolerance, weed resistance, disease resistance, and compatability with overseeded wintergrasses. Tifton 57, officially released as "Tiflawn" in 1952, continues to be the best variety for football fields, playgrounds, and other areas that receive rough treatment. It was too coarse and made too much growth for golf greens.

The next product of our turf breeding program was "Tiffine" (Tifton 127), a cross between Tiflawn and *C. transvaalensis*. This sterile triploid had a softer, finer texture and was better suited for golf greens than Tiflawn. It was soon replaced, however, by Tifgreen (Tifton 328), an F_1 triploid hybrid between *C. transvaalensis* and a superior *C. dactylon* from a golf green at the Charlotte Country Club in North Carolina.

Tifgreen, officially released in 1956, made a better putting surface than other varieties and has been extensively planted on golf greens. It has also been used to a lesser degree on fairways, tees, and lawns.

Our fourth improved turf variety (released in 1960) was Tifway, (Tift 419), a dark-green sterile triploid *(C. transvaalensis* x *C. dactylon)* hybrid with greater frost tolerance than Tifgreen. Its stiffer leaves and greater pest resistance than Tifgreen made it particularly well suited for golf fairways and tees, lawns, and athletic fields with moderate wear.

In 1965, we released Tifdwarf, a vegetative mutant of Tifgreen. Tifdwarf has finer stems, shorter internodes, and smaller, softer, darker green leaves than Tifgreen. It makes a denser turf than Tifgreen and, when mowed at 3/16 inch and properly managed, makes a putting surface comparable with the best bentgrasses. Although planted on lawns, it is best suited for golf greens.

Most of the other named varieties of turf bermudagrasses, such as "Everglades," "Ormond," "Bayshore," "Pee Dee," "Santa Ana," and "Sunturf" are *C. dactylon* x *C. transvaalensis* F_1 hybrids that occurred naturally, frequently on golf courses when *C. transvaalensis* was being tested on golf greens. Their superiority in part of a golf green led to their isolation, increase, naming, and release.

Present

All interspecific *C. dactylon* x *C. transvaalensis* hybrids are sterile and shed no pollen. This makes them attractive lawn grasses for people who are allergic to bermuadgrass pollen. Such sterility facilitates their control, yet it imposes no serious handicap on their use, because they can be easily propagated by planting sprigs. The sterility of these hybrids does, however, prevent their improvement by the common plant-breeding methods of hybridization and selection.

Attempts in recent years to improve the "Tif"-bermudagrasses by making new interspecific hybrids have failed. The best of these (nearly as good as the "Tifs") are being kept in our nursery as insurance against a possible disaster such as the 1970 corn-blight disease. It now appears that radiation breeding will be the most practical way of improving these highly successful varieties.

The success of the natural mutant Tifdwarf suggested to us several years ago that increasing the natural mutation rate with the aid of mutagenic agents could create other useful varieties. Such mutants should retain most of the superior traits of the "Tif"-bermudagrasses while differing in such traits as plant color, size, and pest resistance. Theoretically, treatment of highly heterozygous plants, such as our "Tif"-bermudagrasses, with mutagens

should create mutations that can be seen in the immediate M-1 generation.

Thus in the winter of 1969-70, with the help of Dr. Jerrel Powell, we began research designed to create mutants in our best triploids, Tifgreen, Tifway, and Tifdwarf. Dormant sprigs (stolons and rhizomes) washed free of soil and cut into one and two node sections were treated with the chemical mutagen EMS and gamma rays from a Cobalt 60 source.

The EMS treatments failed but the proper concentration of gamma rays (7,000 to 9,000 r) produced 158 mutants. These were increased and planted in plots at Tifton, Ga., and Beltsville, Md., where they have been evaluated for several years. Several of the mutants (smaller and slower-growing than Tifdwarf) seem to have no economic use except perhaps in some miniature garden. Other mutants that seemed better than their parents, Tifgreen, Tifway, and Tifdwarf, early in the test period now are recognized as no better if as good. New varieties must be better than those now available, and satisfying this requirement is not easy.

Future

We still have nine mutants that appear to be better than their parents in one or more characteristics. Two of these seem to be immune to rootknot nematode. Two seem to be able to tolerate attacks from several nematode species without loss of vigor. One mutant rarely produces seed heads. These nine mutants and their three parents are being increased in the greenhouse this winter. With the help of Dr. A.W. Johnson and Dr. Homer Wells, ARS, USDA, nematologist and plant pathologist, we plan to evaluate these 12 grasses in large replicated plots. We also plan to conduct at least one more greenhouse test to assess their resistance to several different nematodes. The field plots will be subjected to several different kinds of management, with and without the benefit of nematicide treatment.

Will at least one of the nine mutants be better than Tifgreen, Tifway, and Tifdwarf? If we could answer that question, we wouldn't conduct the tests described above. We know they must be better if they are to improve the game of golf. That has been our goal for more than 30 years and will continue to be.

Great Golf Courses of America —*Factors of Play*

by JAMES R. GABRIELSEN
Peachtree Golf Club, Ga.
United States Walker Cup Team—1971

Great golf courses of America is a fascinating subject because of the large number of wonderful golf courses in this country. Which are considered great and why? The longer I thought about that question, the more I came to realize that there is no simple answer.

One of our popular golf magazines conducts a survey among players every other year to pick America's top 100 golf courses. When you look at the first 10 or 20 courses on that list, it's amazing to see the variety in course design, length, and other factors, such as size of greens and number of bunkers. What common blend of characteristics makes those courses stand out above others. Courses like Pebble Beach and Augusta National, Pinehurst and Merion certainly have contrasting styles of architecture and use of terrain, but they are considered by most to be among the best courses in the world.

I want to discuss the factors of play and how they relate to a so-called great golf course. Let me begin by saying that factors of play such as turf, greens, tees and hole locations do not necessarily have to be ideal in order to have what is referred to as a great golf course. Naturally, the tournament player would want to have conditions to his liking, and very often does, but a great golf course will maintain integrity even when the conditions are not ideal from a player's point of view. However, if you were to ask a group of tournament golfers, be they professional or amateur, what type of playing surface they prefer, you would probably get a rather consistent answer:

1. Fast and true greens.
2. Greens that will hold well.
3. Tees that are level and firm.
4. Fairways closely cut.
5. Hole locations that are challenging but fair.

Now, let's examine these factors a little closer.

Good greens, from a player's point of view, are essential for a great golf course. A fast putting surface is preferable because the player can usually putt most effectively when he can slowly stroke the putt with little physical exertion as opposed to hitting the putt with the blow required of a slower green. Short putts are generally easier on a faster surface because of the light, easy stroke required. The trueness of a green is a characteristic which varies with types of grasses and physical terrain. Lessening the effect of grain adds to the true roll of the ball.

Greens that will hold a shot of varying length is