# A HISTORY OF TURF RESEARCH AT TIFTON

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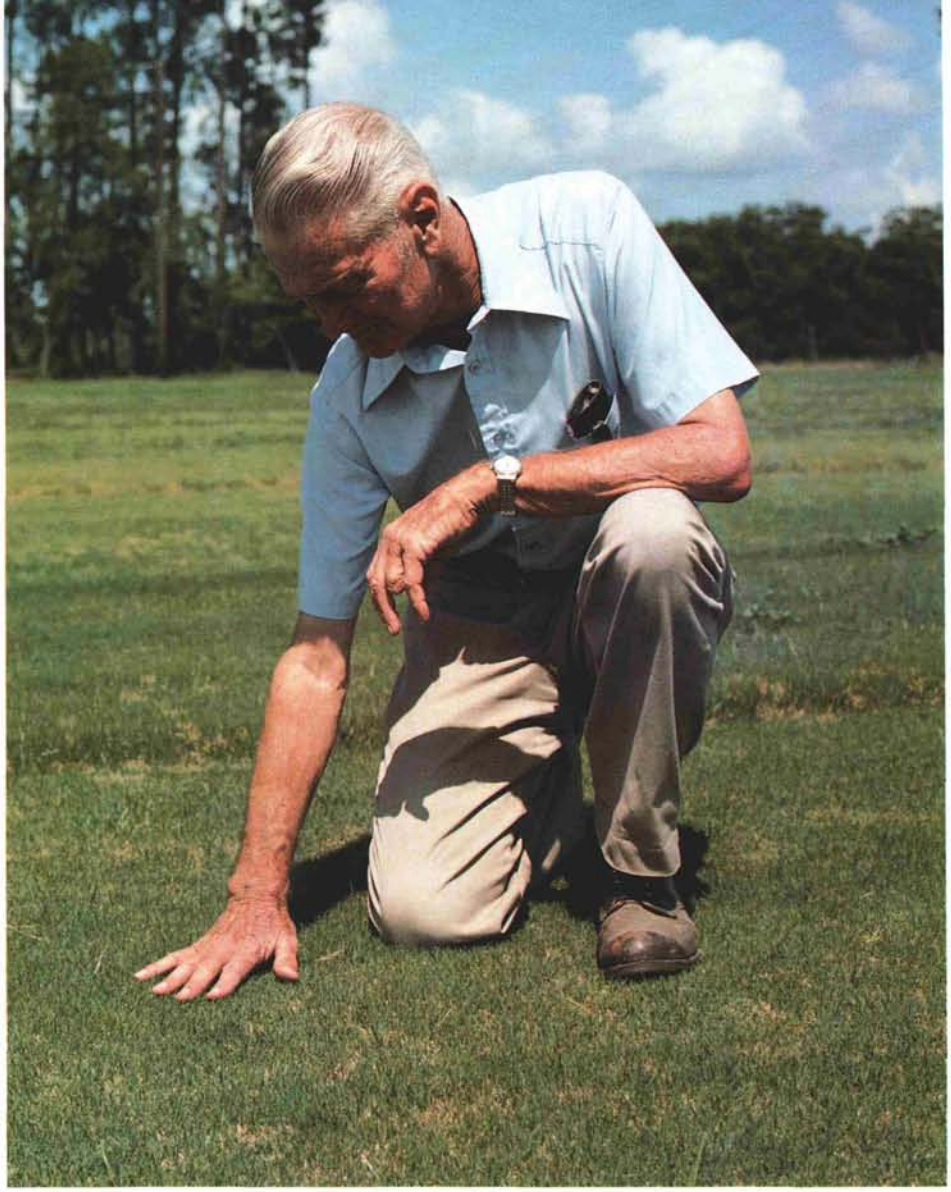

*Dr. Glenn Burton examines the turf produced by a new bermudagrass hybrid.*

TURF RESEARCH at Tifton, Georgia, began in 1946 with a $500 annual USGA Green Section grant to supplement the USDA-University of Georgia forage grass breeding research program begun in 1936. A survey of turf in the South by USDA scientist O. S. Aamodt and Fred Grau, USGA Green Section Director, had revealed a host of turf problems and practically no research to solve them. Developing a better bermudagrass to replace the sand greens or seeded bermudagrass greens became the first objective of the new research program.

In the fall of 1946, cupcutter plugs from the best turf on the best greens from a number of Southern golf courses were collected. These selections were increased and planted along with turf-type by-products of the pasture breeding program in 2-inch clay pots (16 of each) in the greenhouse. In April, 1947, these plants were used to establish 10-foot square plots arranged with a seeded plot of common bermuda in the center of each group of nine. Beginning in August, 1947, these plots were subjected to golf green management for three years. Annual ryegrass was planted on half of each plot to study the spring transition. Again and again, throughout the season all plots were visually rated for sod density, color, frost and drought tolerance, resistance to weeds and diseases, transition effects, and overall turf quality.

In October, 1947, common bermudagrass from seed looked about as good as any of the selections. But after three years of testing, common bermuda from seed proved to be one of the poorest in the test. The best entry was number 57, an $F_1$ hybrid between a very dense dwarf and a disease-resistant selection from the pasture breeding program. This hybrid, after much testing, was officially released as Tiflawn bermudagrass in 1952.

Tiflawn, like common bermudagrass, is a tetraploid with 36 chromosomes. Additional tests proved that Tiflawn was too coarse and produced too much growth for golf greens.

TO DEVELOP a finer turf, Tiflawn was crossed with the fine-leafed 18-chromosome *Cynodon transvaalensis*. The best of the many crosses made and tested was called Tifton 27 and later was named Tiffine. It had finer, softer leaves, made a better putting surface, had 27 chromosomes and was completely sterile.

A better putting-green grass was Tifton 328, later named Tifgreen and

released in 1956. Tifgreen was the best of many 27-chromosome sterile hybrids between *C. dactylon*, taken from the 4th green of the Charlotte Country Club in North Carolina. Tifgreen's fine, soft, forest-green leaves, few seedheads, and ability to make an excellent putting surface when mowed daily at a height of ¼" account for its popularity and use worldwide.

A better 27-chromosome sterile interspecific hybrid for tees, fairways, athletic fields, and lawns was tested for three years as Tifton 419. Its superior characteristics included a darker green color, greater frost tolerance, earlier spring growth, denser weed-free sod, greater disease and insect resistance, greater wear tolerance, and greater leaf stiffness that gives a better lie to the golf ball than Tifgreen. It was officially released and named Tifway in 1960.

Beginning in 1946, a number of experiments were conducted at Tifton to learn how to grow better turf in the South. To determine the pH requirements of Southern turfgrasses, lime was applied to raise the pH of the Tifton loamy sand (pH 5.5) to 6.5, and sulfur was applied to drop it to 4.5. Growth of the principal turfgrasses showed that applying lime improved St. Augustinegrass and ryegrass turf, but hurt carpetgrass and centipedegrass. Carpetgrass grew well at pH 4.5, and bermudagrass grew well at all pH levels.

Research designed to determine the N-P-K fertilizer ratio required to grow good bermudagrass showed that a 4-1-2 to 4-1-3 ratio was adequate. Using these ratios to replace the 4-12-4 used at that time saved a lot of phosphorus and reduced the maintenance budget.

ATTEMPTS to use old pine sawdust, before and after composting, as an organic source for golf green topdressing failed. Evaluation of other sources was discontinued when sterilized loamy sand soil with no organic matter proved to be the best topdressing material for bermudagrass greens.

Some of the first research with the arsenical herbicide PMAS proved that it would selectively kill young crabgrass in bermudagrass turf. MSMA soon replaced it. Early research with 2,4-D found noticeable differences in the concentrations tolerated by the different turf bermudagrasses. The discovery that 2,4-D was an excellent postemergent herbicide for broadleafed weeds is still used to hasten establishment of vegetatively propagated bermudagrasses.

Nitrogen fertilizers evaluated for turf bermudas included ureaform nitrogen, ammonium nitrate, ammonium sulfate, urea, and milorganite. Milorganite gave slightly better turf, but frequent applications of ammonium nitrate made the greens look about as good as milorganite and the slow-release ureaform materials, and it cost a lot less.

To test the shade tolerance of Southern turfgrasses without root competition under trees, 6′ × 12′ frames covered with green plastic screen that excluded two-thirds of the light were suspended 12" above plots of the grasses to be tested. The grass plot under each shade and the check of the same grass beside it were mowed at heights of 1¼" and 2¼". All grasses that received full sunlight maintained adequate density and color throughout the season regardless of mowing height. All shaded grasses clipped at 2¼" produced better turf than at 1¼". St. Augustinegrass and *Zoysia matrella* were the most shade tolerant, and common bermudagrass was the least. Tiflawn and Tifgreen cut at 2¼" were more shade tolerant than common bermudagrass.

Centipedegrass had been planted vegetatively on several lawns in 1936. It can now be established from seed thanks to Tifton research that demonstrated the fertilization and management required to produce centipedegrass seed commercially.

When golf carts appeared on the scene, golf course superintendents expressed great concern over the damage they might do to turf. As a consequence, a three-wheel golf cart with three different tires was driven at three different frequencies over the Tif bermudas, fertilized differently, and cut at different heights, until the tracks of the tires had nearly destroyed the turf on the poorest treatments. The results of that research helped golf cart manufacturers choose tires that would least injure the turf. Tifway bermudagrass was the most wear-tolerant grass, and fertilizing the grasses and raising the height of cut increased their wear tolerance.

Tifdwarf, officially released in 1965, was first discovered by USGA Green Section agronomist James B. (Monty) Moncrief. It was a small circle (18" in diameter) in a golf green planted experimentally to Tifgreen on the Florence, South Carolina, Country Club several years before Tifgreen's release. A few weeks later, T. M. Baumgardner brought to Tifton a plug taken from a similar circle of grass on a golf green on the Sea Island Golf

*Experimental bermudagrasses were tested for wear tolerance by using different golf cart tires, fertilizer rates, and cutting heights.*

Course, which had been planted to the same Tifgreen material from Tifton.

The dwarf bermudagrass in both plugs was isolated, increased, and planted in an evaluation test with Tifgreen and two other grasses. Three years of testing indicated that the dwarf bermudagrass was a natural mutant of Tifgreen that had occurred before its sprigs had been sent to several golf courses for early evaluation. The Florence and Sea Island golf courses apparently received some of this mutant in the experimental sprigs, and their golf green management allowed the dwarf mutant to spread into the Tifgreen sod.

Tifdwarf is a sterile triploid and has many of the same characteristics of Tifgreen but has smaller, shorter leaves, stems, internodes, and stolons, and establishes more slowly. It has a darker green color than Tifgreen due to its greater concentration of purple anthocianin, which gives Tifdwarf a purplish cast when temperatures approach freezing in the fall. Tifdwarf will tolerate closer mowing than Tifgreen and is the only bermudagrass that can produce the fast greens that some golfers demand today. When properly managed, Tifdwarf greens can be comparable to bentgrass greens. In fact, northern golfers playing on such Tifdwarf greens have asked the golf course superintendent the name of the bentgrass on their greens. A number of years ago, Ben Hogan completed 18 holes on a well-managed course with Tifdwarf greens and Tifway fairways and tees and said, "That is the best turf I've ever played on."

THE STERILE triploid hybrids cannot be improved by conventional plant breeding methods. They can be modified by exposing dormant sprigs of the triploids to 7,000 to 9,000 r of gamma rays from a cobalt-60 source. This was done at Tifton in 1970 and resulted in 158 mutants of Tifway, Tifgreen, and Tifdwarf that were evaluated until 1981, when a mutant of Tifway was released as Tifway II. Tifway II looks like Tifway but is more resistant to root knot, ring, and sting nematodes, is more frost tolerant and greens up a little earlier in the spring.

In 1983, Tifgreen II, a mutant of Tifgreen that has a lighter green color, greater cold tolerance, lower maintenance requirements, and better spring recovery was released. It is a little coarser than Tifgreen and makes a less desirable putting surface.

The most recent Tifton release is Tifton 10, a clone that I found in a lawn in Shanghai, China, in 1974. It has 54 chromosomes instead of 27 or 36, sets few seeds, and must be propagated vegetatively, but spreads faster than the Tif bermudas. It has dark bluish-green color, good winter-hardiness, salt tolerance, and ring nematode resistance. Tifton 10 is coarser than the Tif bermudas.

Research on the transition problems, establishing cool-season grasses on bermuda greens in the fall, and recovering bermudagrass when the cool-season grasses die out in the spring, revealed that the spring transition could best be solved by building a strong, undisturbed bermudagrass turf in the fall. Cool-season grasses, including bents, fescues, and *Poas*, were compared with annual ryegrass for overseeding before turf-type perennial ryegrasses became available.

Other research projects conducted over the years at Tifton include:

- Disease, nematode, and insect studies and development of control measures.
- One of a number of crosses between *Zoysias japonica* and *Zoysia tenuifolia* became Emerald, a superior vegetatively propagated, matrella-like cultivar.
- A comparison of warm-season grasses ranked the Tif bermudas at the top in drought tolerance and the *Zoysias* first in cold tolerance.

Developing better quality, more winter-hardy triploid bermudagrasses continues to be the major emphasis of the turf research program at Tifton today. New hybrids are being made and tested. Dr. Wayne Hanna, now responsible for most of this research, has used mutation breeding to improve the quality of the winter-hardy "Midiron" bermudagrass and dwarf Tifton 419. Improved centipedegrass and turf bahiagrasses are also being developed.

The author gratefully acknowledges the assistance of a great host of people, students, technicians, colleagues, and friends, who at some time helped with the research described here.

*Mutations of Tifton 328 and Tifton 419, induced by cobalt 60, were established in the field to evaluate turfgrass quality.*