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Genetics and Bermudagrass: It's Not Easy Being Uniformly Green

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It's Not Easy Being Uniformly Green

Golfers and golf course superintendents expect a lot from their putting greens. They want fine, lush, carpetlike surfaces that a ball will roll smoothly across. They also want a grass that tolerates frequent low mowing, has uniform color and texture, tolerates pests and cold temperatures, and offers a dense canopy that shades out weeds to minimize the need for herbicides.

Southern putting greens are made up of single cultivars of bermudagrass, but golf course superintendents have complained for years about the appearance of nonuniform plants, or "off-types," that can throw off the green's appearance and "playability." The bermudagrass cultivar Tifgreen, released in 1956, launched the era of high-quality, vegetatively propagated turfgrasses, but has also led to problems with the appearance of off-types on putting greens. Off-types can be caused by bermudagrass weeds or mutation of the cultivar. Mowing as well as birds and other natural phenomena increase the risk of weeds appearing on putting greens. Herbicides, ultraviolet light in sunlight, and errors during normal DNA replication can also induce mutations in the grass itself. The resulting inconsistencies have cost golf courses and sod farms millions of dollars over the years, forcing them to kill and reestablish entire greens.

Fortunately, help is available from experts like Karen Harris-Shultz, a geneticist in the Agricultural Research Service's Crop Genetics and Breeding Research Unit in Tifton, Georgia. Harris-Shultz uses the plant's DNA to tell one type of bermudagrass from another and identify unwanted types of grass. She has developed a new tool to help distinguish among the different cultivars and improve on those diagnoses.

Golf course superintendents and sod farm managers often send off-type samples to Harris-Shultz for analysis. They need to know the identity of off-type on their greens before deciding how to proceed. Sometimes, after killing off a putting green to renovate it, they fear that the old grass wasn't killed entirely before the new grass was planted. They often want to know whether their off-type patches are caused by a previously planted cultivar, a bermudagrass weed, or a mutation of their planted cultivar.

"Turf grasses are a major business, and if you're selling turf or sod, you want it to be stable, not constantly mutating and changing," says Harris-Shultz.

But even with the best molecular tools, the grass varieties are so alike that it is sometimes hard to tell them apart. The lines used on putting greens throughout the southeastern United States are all offshoots of varieties developed more than 40 years ago by the late Glenn Burton, a former ARS grass breeder in Tifton. Many bermudagrass cultivars are vegetatively propagated monocultures, and the close genetic similarity within the Tifgreen family makes it hard to tell cultivars apart.

Harris-Shultz collected 15 Tifgreen-derived cultivars from golf courses and research partners, extracted DNA from them, and with the help of an existing DNA database, she developed a tool to help distinguish bermudagrass cultivars and identify contaminants. She used a library of expressed sequence tags, which are unique gene segments, for bermudagrasses and 23 previously discovered simple sequence repeat markers, which are short repeating segments of DNA. The results, published in the *Journal of the American Society of Horticultural Sciences,* identify "repeatable polymorphic fragments" of DNA that are unique for each cultivar and can be used not only to distinguish among the different grasses, but also to trace relationships between them.—By **Dennis O'Brien,** ARS.

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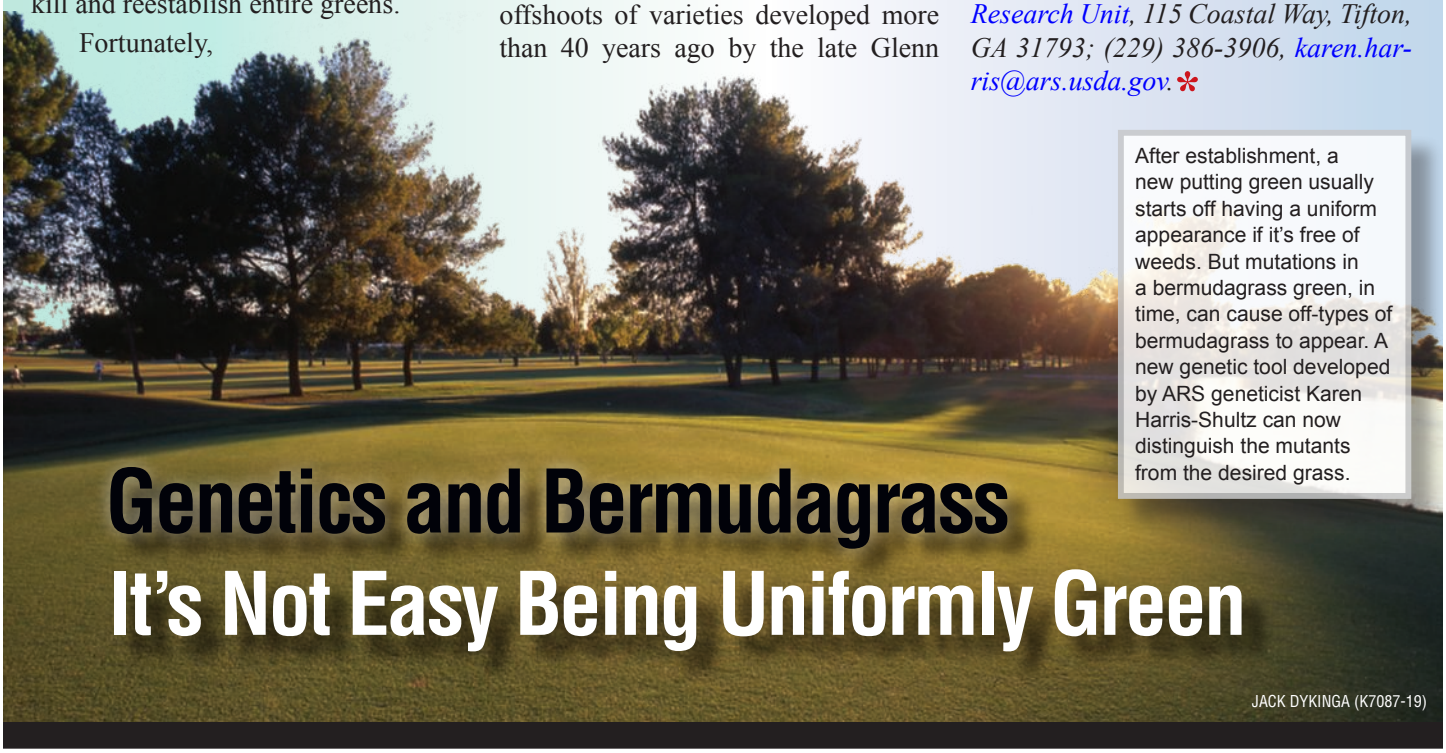

After establishment, a new putting green usually starts off having a uniform appearance if it's free of weeds. But mutations in a bermudagrass green, in time, can cause off-types of bermudagrass to appear. A new genetic tool developed by ARS geneticist Karen Harris-Shultz can now distinguish the mutants from the desired grass.

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