

Established putting greens should be closely monitored and rouged on a regular basis to remove off-type contaminants and reduce the need for major renovation.

# Off–Types in Ultradwarf Putting Greens

Spot infestations of different bermudagrasses in putting greens are a resurfacing issue with the ultradwarf cultivars.

### BY TODD LOWE AND JOHN FOY

he ultradwarf bermudagrasses (Champion, Mini-Verde and TifEagle) have been available since the late 1990s and have outperformed their predecessors Tifgreen and Tifdwarf in research trials (Morris, 2003) and on putting greens. Superior surface smoothness and faster putting speeds can be maintained with these grasses because of their finer leaf blade texture, greater shoot density, and tolerance to lower mowing heights. Many golf courses throughout the southern United States have converted to an ultradwarf bermudagrass, and this has raised the bar as far as putting green quality.

Golf courses in the transition zone have also realized benefits of ultradwarf bermudagrasses. Bentgrass has long

been favored because of its superior putting characteristics compared to Tifgreen and Tifdwarf. However, bentgrass struggles during the summer months, a time when peak playing conditions are desired in the transition zone. Many bentgrass putting greens have suffered severe turf loss with extreme heat and humidity, as greens are stressed to produce fast speeds at the expense of turf health. Bermudagrass has been viewed by golfers in the transition zone as a second-class citizen, but ultradwarf cultivars have changed this opinion with their excellent playing conditions.

Development of spot infestations of off-type bermudagrasses has also been a longtime problem with Tifgreen and Tifdwarf bermudagrass putting greens, resulting in a change in composition over time from a monostand to a collection of different bermudagrasses (Foy, 1997; Busey, 1997). Typically, off-types became noticeable within five years after planting Tifdwarf bermudagrass, growing in size and number over a short period of time. Many Florida golf courses regrassed putting surfaces every 10 to 15 years due to a progressive increase and poor performance of bermudagrass off-types (Foy, 2003).

It was hoped that ultradwarf bermudagrass putting greens were immune to off-types, as there were very few apparent issues within the first seven or more years. In fact, there are ultradwarf bermudagrass putting greens that are more than 12 years old



that have no apparent off-types at this time. However, off-types have become a significant issue on golf courses in recent years. This article attempts to shed greater light on bermudagrass off-types on ultradwarf bermudagrass putting greens and offer some insight as to how they are currently being managed.

### OFF-TYPES: WHAT ARE THEY?

The definition of an off-type is (1) plants or seeds that do not conform to the characteristics of a cultivar as described by the breeder; (2) plants or seeds that are not necessarily of any cultivar; (3) plants or seeds resulting from crosspollination by other kinds or cultivars; (4) segregates from any of the above plants (Beard, 2005). Off-types are not necessarily all bad, but are simply different than the desired grass. Since the goal of golf course superintendents is to maintain a consistent and uniform play and aesthetic character, most off-types are considered undesirable, as they exhibit colors, growth rates, and textures that are different than the desired base turf.

Not all off-types behave the same. Some off-types are completely benign and simply possess a different color from the desirable base bermudagrass. Other off-types have a finer turf quality and better playability throughout the year than the desirable turf. In fact, Tifdwarf, Champion, and Mini-Verde were originally off-types discovered on golf course putting greens. However, other off-types grow more aggressively at times and create significant surface disruption and poor putting green performance.

Some growth differences are seasonal and only cause slight maintenance concerns at certain times. An example is an off-type bermuda that exhibits color differences in response to cooler temperatures. Simply because there is a mixture of different grasses on a putting green does not necessarily mean there is a problem. An example is the segregation that occurs with bentgrass putting greens. Off-types that differ only in color, or those that produce a finer texture, are generally non-problematic, but aggressive bermudagrass off-types are a concern and impact putting green management programs. These off-types are more easily scalped and become thin to bare following moderate



If not controlled, fairway and rough bermudagrass will encroach into ultradwarf bermudagrass putting greens, and this then becomes a source of off-type contamination.



to severe vertical mowing. As a result, higher mowing heights and reduced verticutting are conducted on putting greens to maintain acceptable turf quality when off-types have become the dominant component of the turf cover.

## WHERE DO THEY COME FROM?

The origin of off-types in Tifdwarf bermudagrass greens is said to be from contamination of the planting stock, on-site introduction of seeds or stems, and genetic mutations (Foy, 1997). Ultradwarf off-types are more than likely derived from similar sources. Off-type contamination of ultradwarf production fields has been found and was reported in a 2009 Green Section Record article entitled Are Ultradwarf Bermudagrass Cultivars Mutating? (Elsner, 2009). In the article, Dr. Earl Elsner, retired director of the Georgia Foundation Seed and Turfgrass, mentioned that conventional sprig harvesting may increase the spread of an aggressive off-type so that it can become a dominant grass in production fields.

Genetic mutation is another means of off-type contamination on ultradwarf bermudagrass putting greens. Many experts believe that genetic mutation accounts for only a small percentage of putting green contamination, since this phenomenon occurs in a very small percentage of a given plant population. Genetic mutation has occurred with bermudagrass in the past, and some have believed that the high stress levels that occur on southern putting greens (high solar radiation, low mowing) can cause mutations on bermudagrass greens (Moncrief, 1975). In fact, several popular commercial varieties are known genetic mutations of Tifgreen and Tifway II bermudagrass. Researchers also have created genetic mutations in Champion bermudagrass following applications of dinitroaniline herbicides (Capo-chichi et al., 2005).

Turf managers often inquire about the use of genetic testing to determine whether a certain grass is an off-type or where it came from. Genetic testing might be a tool to use, but it is rather



Off-types that have distinct differences in growth rate and texture present major problems for superintendents to provide acceptable play and aesthetic character.

inconclusive at this time. Dr. Elsner states, "The rule of thumb in the Georgia Certification program is that DNA fingerprints are tools but not necessarily the final answer. *If a plant looks different, grows differently, or reacts differently, it is an off-type.*" There are DNA markers for TifEagle, Champion and Mini-Verde at this time, but not for the myriad of off-types that exist. Therefore, it is nearly impossible to determine the origin of off-types through genetic testing. In other cases, off-types begin from contamination along putting green perimeters. The off-types may be from the surrounding fairway or rough bermudagrass, or possibly they are greens-type bermudagrasses that were not killed prior to regrassing. The authors have seen both coarse textured and very fine textured bermudagrasses that differ from the desired ultradwarf in putting green perimeters. Infestation generally begins with small patches in putting



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green perimeters, but it can quickly spread into the interiors through cultivation practices like verticutting and core aeration. These practices are aggressive, as they open up the turf canopy, loosen the soil, and cultivate bermudagrass stolons and rhizomes (stems). These stems contain nodes that can create new plants when they are moved and inserted into an open area of the turf.

Another form of on-site contamination occurs with "no-till" regrassing. No-till regrassing saves money and decreases establishment time, as the existing turf is merely killed with herbicides and, possibly, fumigated with methyl bromide. However, the existing turf and underlying organic matter are left intact with this method of establishment. Since the turf is not removed, any remaining stems that are still viable can contaminate the new putting surfaces. Consider this: methyl bromide fumigation is the most effective means of killing any existing plants, but it is only 95% effective at eradicating bermudagrass. An average golf course has 90,000 to 120,000 sq. ft. of putting surface, so nearly 4,500 to 6,000 sq. ft. of bermudagrass can remain viable following a renovation. This material can quickly spread following cultivation practices like verticutting and core aeration. In the transition zone, no-till regrassing most often involves conversion of bentgrass to an ultradwarf bermudagrass, and redevelopment of bentgrass contamination has not been a problem. However, in the deep South. conversion of an older bermudagrass variety to an ultradwarf bermudagrass most often reveals significant off-type contamination quickly following the renovation.

#### MANAGEMENT OF OFF-TYPES

While there may be only a limited number of producers for each cultivar, purchasing sprigs from a reputable producer will greatly reduce the chance of contamination from a production field. Do your homework. Visit several producers with a keen eye not only on the production fields, but also on the equipment, peripheral areas, and overall operation. It is important that dead patches from herbicide applications are seen, as this means that some type of rouging occurs in the production fields.

It is difficult or impossible to see off-types in production fields, even for a trained eye, and another important practice is to call several golf courses that were previously grassed by a particular producer. Since it can take several years for off-types to become apparent on putting greens, it is important to check out courses that were grassed at least three to five years prior. Spending a little more money up front to purchase sprigs from reputable producers is a wise investment.

While not always an option, additional money should be spent on proven renovation techniques to reduce the likelihood of onsite contamination. The best process for regrassing is to completely remove the existing turf and rootzone mixture, followed by installation of new rootzone mix and soil sterilization with methyl bromide. However, complete renovation is also the most costly and may not be necessary if the putting greens drain appropriately. Next is "strip and till," where the turf and upper few inches of rootzone (depending on depth of the organic layer) are replaced with new sand-peat mix and then fumigated before sprigging. No-till regrassing is the least expensive, but it is also least effective at killing the existing bermudagrass.

Let's face it, not all golf courses share the same quality standards. Offtype contamination with no-till regrassing might be acceptable at some courses if an ultradwarf bermudagrass base will provide better playing conditions in the long run. These courses take the risk of off-types affecting turf quality and eventually dictating maintenance programs, but the authors have visited such courses that could not afford conventional regrassing and have been pleased with the overall results. Other courses may have zero tolerance for off-types and the potential of poor performance. If the golf course has high standards for genetic purity following the renovation, then more money should be spent for practices like removing the upper rootzone or

complete renovation and fumigating with methyl bromide.

It is strongly recommended to fumigate not only the putting surfaces but the surrounding collars and immediate rough too. This practice will significantly reduce the occurrence of remnant bermudagrass encroachment from the collar's edge. Another good practice is to sod the collars following fumigation. This creates a definite edge along putting green perimeters and further reduces emerging contaminants. After sprigging, the putting greens should be closely monitored on at least a weekly basis during the grow-in, and any areas of contamination should be spot sprayed with a non-selective herbicide and then killed and removed.

Since putting green perimeters can be a significant source of off-type contamination, it is important to be mindful of this when aggressive cultivation practices like verticutting and core aeration are conducted. Stems from contaminated perimeters can be easily transported into putting green interiors during the cleanup process. Putting green perimeters should be treated more like collars, as encroachment is sometimes difficult to detect. Debris from vertical mowing and core aeration should be blown into the adjacent rough and never into putting green interiors. Perimeters also should be mechanically edged on a regular basis during the growing season and runners removed by hand.

Continuing to closely monitor the putting greens and rouging to remove off-types as they become visible should be an ongoing component of the management program. A large, clean on-site nursery putting green is necessary to replace spot infestations of off-type bermudagrass. Spraving patches with glyphosate prior to removal may improve control, but it may also cause more problems with golfers, as dead off-type patches are much more conspicuous. Contamination generally begins with small patches that can be removed and replaced with cup cutter or hexagon plugs from the nursery. Plugging out contaminants is an easier task when patches are small in size and number.





While visually detracting, some off-types can be successfully managed and do not have a real impact on the play characteristics of the putting greens.

However, putting greens with large or numerous infestations are impossible to rouge, and complete regrassing may ultimately be the only option for redevelopment of a monostand turf cover.

In conclusion, the ultradwarfs possess several improved performance characteristics and have established a new and higher standard as far as bermudagrass putting green quality. However, it has become apparent that they are not immune to the longtime issue of off-type surface contamination. Sometimes this is only a cosmetic concern, but there have been growing numbers of cases where off-types are having a pronounced impact on both putting green quality and management programs. The intent of this article has been to make everyone aware of the issue and the measures that can be utilized to extend the life expectancy of ultradwarf bermudagrass putting greens.

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