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TURFGRASS TRENDS

COLONIAL BENTGRASS

Colonial Bentgrass Can Lower Fairway Inputs

By Stacy A. Bonos

Higher energy prices have increased the costs of almost everything, including grass seed, fertilizer and pesticides. As the costs of energy rise, many are looking for ways to cut costs. Additionally, more emphasis is being placed on conserving natural resources and reducing inputs. With all of that in mind, colonial bentgrass on your fairways might make sense for some golf courses.

Creeping bentgrass (*Agrostis stolonifera*) is currently the most widely used bentgrass for golf courses. Its prostrate growth habit and ability to produce vigorous spreading stolons allow it to tolerate low cutting heights and quickly recover from damage. This makes creeping bentgrass a good choice for golf course putting greens in the cool, temperate climates and some cases in warm climates. However, creeping bentgrass as a species is very susceptible to dollar spot disease (caused by *Sclerotinia homoeocapa* F.T. Bennet) and typically requires regular fungicide applications and rigorous cultural practices for acceptable quality.

Dollar spot disease is probably the most common disease on golf course turf in the Northeast. Although breeders have developed creeping bentgrass cultivars with improved resistance, they still can require several fungicide applications per year. Colonial bentgrass (*Agrostis capillaris*) generally has better tolerance of dollar spot disease than creeping bentgrass (Photo 1).

Colonial bentgrass, also known as brown top, has traditionally been used on lawns and golf courses in areas of Northern Europe and New Zealand that have mild (cool and humid) summers. Compared to creeping bentgrass, colonial bentgrass has a more upright growth habit and spreads by short rhizomes instead of stolons. In addition to differences in growth habit, colonial bentgrass also differs in genetic color.

PHOTO 1

Dollar spot disease resistance of colonial bentgrass (left) compared to creeping bentgrass (right).

Colonial bentgrass ranges from light to medium green while creeping bentgrasses typically range from medium green to a dark blue-green color (Photo 2, p. 60). Additionally, colonial bent-

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grass typically retains more green color during winter compared to creeping bentgrass. Colonial bentgrass also does not accumulate thatch as aggressively as creeping bentgrass cultivars with high shoot density. High-density creeping bentgrasses can require adjustments in management practices, including increased topdressing and cultivation (aeration, verticutting and grooming) to manage thatch development. Colonial bentgrasses typically do not require aggressive cultural management. Additionally, it has been documented that colonial bentgrass exhibits faster recovery from drought stress compared to creeping bentgrass (DaCosta and Huang, 2007; DaCosta and Huang, 2006). The drought recovery, reduced maintenance requirements and increased dollar spot resistance of colonial bentgrass make it an interesting choice for golf course fairways during a time when environmental conservation, using lower inputs and energy conservation are on the minds of many people.

However, colonial bentgrass does have a major weakness affecting its use in temperate areas of the United States. It is susceptible to brown patch disease (caused by *Rhizoctonia solani* Kühn) (Photo 3). Brown patch can cause some loss of turf density on creeping bentgrass, mainly during July and August, but severe damage from brown patch disease is unusual on creeping bentgrass in the Northeast and north-central United States. Colonial bentgrass cultivars, however, are quite susceptible to brown patch disease, and loss of turf density (damage) can be strongly evident from June through September.

It has been the goal of the breeding program at Rutgers for the past 10 years to improve the brown patch resistance in colonial bentgrass so that it will be more useful as a potential grass for fairways and tees. Prior to this research, there were no studies conducted on the inheritance of brown patch resistance in colonial bentgrass. It is important to understand how disease resistance is inherited in order to optimize selection procedures.

Traits can be inherited in different ways. Qualitative inheritance typically involves one (or a few) genes that confer complete resistance and are not strongly influenced by the environment. Quantitative inheritance involves a large number of genes that confer partial resistance and are strongly influenced by the environment. If brown patch is inherited qualitatively, then selection could be conducted in one environment, possibly with limited replications. If brown patch is inherited quantitatively, then steps need to be taken to determine the extent of environmental influence

PHOTO 2

Color differences of colonial bentgrass compared to creeping bentgrass. Colonial bentgrass plots have a bright, medium-green color compared to the dark, blue-green color of creeping bentgrass plots.

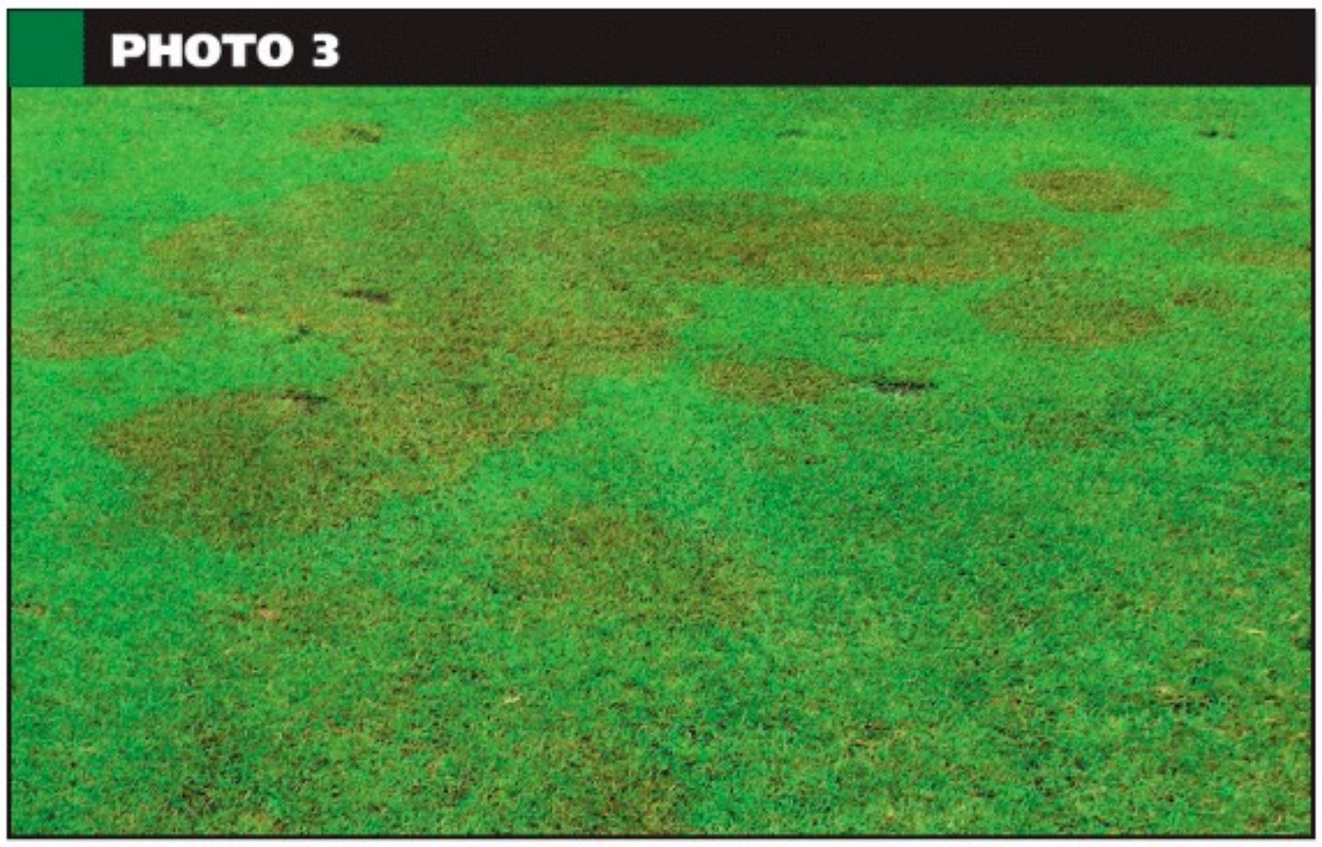
on the disease compared to the genetic influence. It also would typically require evaluation in a number of environments with multiple replications. Preliminary research on brown patch resistance in tall fescue indicates that resistance may be quantitative (Simmons and Hamblin, 2002; Bonos et al., 2004; Bokmeyer et al., 2006). We have previously shown that dollar spot resistance in creeping bentgrass is most likely quantitatively inherited (Bonos et al., 2003; Bonos, 2006).

We have been investigating several selection techniques to improve brown patch resistance in colonial bentgrass. Selecting plants based on turf plot evaluations has only resulted in moderate improvements in brown patch resistance. However, we have found that selecting plants based on mowed spaced-plant evaluations has resulted in greater improvements in disease resistance compared to turf plot selection.

Individual colonial bentgrass progeny plants from seven controlled crosses between tolerant and susceptible parents were planted into a stand of perennial ryegrass in the fall of 2001. The mowed-spaced plant trial was maintained at 1.9 centimeters (¾ inch). Tolerant and susceptible parent plants were planted with three replicates. All plants were inoculated with a mixture of two different brown patch isolates isolated from colonial bentgrass. The isolates were grown on sterilized Kentucky bluegrass seed and applied with a drop spreader at approximately 0.25 grams per square meter (g/m^2). Brown patch disease was evaluated weekly after symptoms began to develop using a scale from 1 to 9, 9 representing least brown patch disease and 1 representing completely susceptible. The symptoms occurred approximately two weeks after inoculation. After two full seasons of brown patch disease pressure, significant differences in brown patch disease among colonial bentgrass clones were evident (Figure 4).

From this trial, we found that susceptible parents were not significantly more susceptible than the tolerant parents. Plants crossed between two tolerant parents were not more tolerant than crosses between tolerant and susceptible parents. These results indicated that brown patch resistance is significantly affected by the environment and suggests that inheritance is quantitative.

PHOTO 3



Brown patch disease on colonial bentgrass.

PHOTO 4

Mowed-spaced plant evaluation trial for brown patch resistance in colonial bentgrass.

The colonial bentgrass clones with high levels of disease resistance in the mowed plant trial were selected and moved to isolated crossing blocks and allowed to inter-pollinate. Seed was harvested individually from each plant to establish single-progeny turf plots. And equivalent amounts of seed from each plant were bulked to make a composite in order to establish replicated turf plots in the fall of 2002.

Entries in the turf plot evaluation trial included standard cultivars and experimental selections from numerous turfgrass breeding programs. Entries in each test were seeded using a maximum of 0.22 g/m^2 [1.3 pounds per 1,000 square feet (ft^2)] of seed. Between 8.9 grams of nitrogen per square meter (g N/m^2)

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PHOTO 5

Colonial bentgrass cultivars selected for brown patch resistance compared to susceptible cultivars.

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and 6.5 g N/m² (2.2 pounds and 1.6 pounds of N per 1,000 ft²) were applied annually (2003 and 2004 respectively). No single N application exceeded 2 g N/m² (0.5 pounds N per 1,000 ft²). The annual fertilization program included two granular N applications in the spring and fall at approximately 2 g N/m² and biweekly liquid N applications during the summer months at about 0.8 g N/m² (0.2 lb N per 1,000 ft²). The trial was maintained at approximately 0.48 centimeters (3/16 inch) cutting height. The trials were rated throughout the growing seasons for turf quality (color, brightness, leaf texture, density, uniformity, amount of disease and amount of insect damage) and brown patch disease. The turf trial was not inoculated with the brown patch pathogen. All disease outbreaks were a result of natural infection.

The mowed-spaced plant selection technique has resulted in dramatic improvements in brown patch resistance in colonial bentgrass. The experimental selections developed using this technique (BCD, 9110–8-10, 9111-6-12) had higher brown patch ratings than standard cultivars that were not selected for brown patch resistance (SR 7100, SR 7150) (Photo 5). This data indicates that this technique is effective in improving brown patch resistance.

This technique was also used to evaluate new collection sources of colonial bentgrass, for brown patch disease. We have identified more than 150 colonial bentgrass plants from 20 European collection sources with improved brown patch resistance. The addition of new sources of resistance helps to maintain the genetic diversity of the species and may increase the durability of resistance. These new European sources of brown patch resistance have been crossed with colonial bentgrasses used in the Rutgers breeding program that are adapted to our climate in the United States. These new experimental selections of colonial bentgrass are able to maintain very good quality even in the presence of heavy brown patch disease pressure.

The results reported here indicate that new colonial bentgrass cultivars selected for improved brown patch resistance should be useful on fairways where reduced inputs are anticipated. Newly developed cultivars can maintain acceptable quality with limited fungicides; they can recover from drought stress quickly; and they do not accumulate thatch aggressively and therefore do not require excessive cultural practices to reduce thatch accumulation. These attributes make colonial bentgrass an attractive alternative to creeping bentgrass for superintendents interested in reducing inputs and conserving energy on golf course fairways.

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