Introducing A New Creeping Bentgrass Cultivar Through Interseeding: Does It Work?

It sounds like a good idea, but there are drawbacks.

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THE RELEASE of several new creeping bentgrass cultivars with higher shoot density, finer texture, and greater tolerance to environmental stresses has led many golf course superintendents to think how best to introduce these new cultivars into their existing creeping bentgrass greens. The most effective means is through total renovation. This consists of killing or removing the existing turfgrass and then reestablishing with a new cultivar. The downside to this approach is the requirement to close the greens until the turf is established. This process could last as long as several months, during which time significant loss of play would occur.

An alternative method to total renovation of greens is a practice that is known as interseeding. In interseeding, the new, desired cultivar is introduced into an established stand of creeping bentgrass over a period of time. The desired result is a gradual conversion of the existing putting green surface of an older cultivar to one containing the new cultivar without serious disruption to the green.

Many of the practices used in interseeding are similar to or adapted from practices used to overseed bermudagrass greens with a cool-season turfgrass during the autumn. Generally, interseeding practices consist of trying to provide the best seed-soil contact possible without totally destroying the existing turf surface. Verticutting, coring, and topdressing are used in various combinations in interseeding programs. The intensity of these practices is generally not severe enough to disrupt or limit play. Practices that attempt to limit the competitiveness of the existing turf, such as using plant growth regulators or mowing at a shorter height of cut also may be used.

Following the mechanical preparation, the new cultivar is broadcast or slit-seeded into the stand. The seeding rate, in many cases, is higher than the normally recommended rates for establishment. Within a few weeks of seeding, superintendents often observe small seedlings germinating. However, after the turf fills in, how do we know how much of the new cultivar is present?

Assessing the Effectiveness of Interseeding

We looked at the effectiveness of one method of interseeding for incorporating new bentgrass cultivars over a four-year period. The putting greens used in this study were located on a golf course and established to Penncross creeping bentgrass. The greens had little if any thatch at the time of interseeding and had full canopy cover. Over the four-year period from 1994 to 1997, the greens were interseeded once with Providence and ProCup, and four times with G2. The procedure for interseeding the greens was similar all four years.

Prior to seeding, greens were aerified with ½-inch or ¼-inch tines and the plugs were removed. Greens were then topdressed and dragged. Seed was applied between 0.25 and 0.37 pounds per 1,000 square feet. The greens were then verticut or dragged to work the seed into the coring holes and turf. A second seeding at 0.25 to 0.37 pounds per 1,000 square feet was applied. Verticutting or dragging was again used to incorporate the seed. The greens were immediately watered, fertilized, and maintained to promote seedling establishment. The greens were initially cut at 5/32" with no baskets. After interseeding G2, mowing heights were gradually reduced to ⅛" over the next six to eight weeks.

In November 1997, we took 28 individual plant samples from a green. We used RAPD (Random Amplified Polymorphic DNA) markers, a molecular

Aerification was used to disrupt the soil surface and prepare the putting green for interseeding a new cultivar.

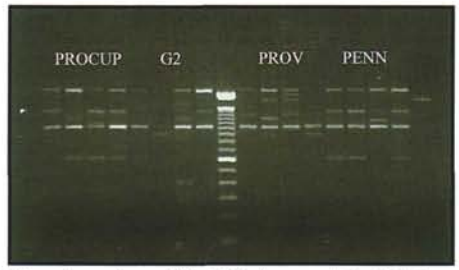
marker technique useful in fingerprinting genotypes, to determine the proportion of each cultivar on the green. We recognized there would be difficulties in determining the amount of newly introduced creeping bentgrass cultivars in the greens. Creeping bentgrass cultivars are synthetics, and thus are a mix of genotypes rather than a single genotype. Some of the genotypes present in the introduced cultivars are likely to be present in Penncross. It was unlikely that we could find a RAPD marker that could specifically identify a cultivar by being present in that one cultivar alone.

To make this study even more challenging, the green in question had been interseeded with three different cultivars over a four-year period. Ideally, we would have sampled the green to get a base reading before interseeding. This would have given us a before and after picture of the population on the green.

Regardless of these obstacles, we still thought we could get some idea of how successfully the newly introduced cultivars had become established on the green if we could identify a RAPD marker that was prevalent in Penncross but rare in the interseeded cultivars. We germinated seedlings of Penncross, Providence, ProCup, and G2, and extracted DNA from the seedlings. After four months of screening primers, we identified one that produced a RAPD marker in 75% of the Penncross and ProCup seedlings, but not in Providence or G2 seedlings.

We amplified DNA from 28 individual plant samples from the green in question using the primer that identified Penncross. Eighteen of 25 (several samples had poor amplification and were not used in the calculations) or 73% of the samples had the distinguishing RAPD marker for Penncross. Based on probabilities, the remaining seven plants were also likely to be Penncross. Since the identifying marker was not prevalent in Providence or G2, we concluded that these cultivars were not present. Although we can't rule out the possibility that a portion of the plants on the green might be ProCup, there is no evidence that ProCup would be any better at establishing than G2 or Providence. We feel confident in the conclusion that there are few, if any, of the newly introduced creeping bentgrass cultivars. Based on our work on this golf course, the greens are probably still Penncross.

Our study assessed the results of one method of interseeding new bentgrass cultivars into existing stands of bentgrass and may not be applicable when other methods are used to enhance establishment. Also, a more comprehensive sampling of various greens from other golf courses undergoing interseeding would be justified. However, in the context of plant competition, our data are very compelling. Actually, it would be more difficult to explain a shift from Penncross to one of the interseeded creeping bentgrass cultivars.



Random Amplified Polymorphic DNA (RAPD) markers were used to fingerprint or identify the proportion of each cultivar in the sample. Markers were determined for ProCup, G2, Providence, and Penncross creeping bentgrass.

The introduction of a cultivar into an existing stand of the same species would result in an extremely competitive situation. This competition is driven by the fact that individuals of the same species share the same requirements for resources. In other words, individuals of the two cultivars are so closely related and differentiation for a niche is so small that exploiting niche differences is difficult. Given that the individuals of the existing cultivar are more mature and already established, they have a distinct advantage in capturing resources such as light, water, and nutrients over the seedlings of the new cultivar. Almost all, if not all the advantages lie with the existing creeping bentgrass cultivar.

What about the new seedlings observed initially after seeding? Germination of seedlings does not depend on a competitive edge. Seedlings, given minimal space and moisture (soil contact), germinate, then live off the nutrients available in the seed. They don't compete with established plants for nutrients, space, light, and water. The question of whether the new seedlings compete once they have used up the energy from the seed has not been addressed. Our results imply that once the seedlings are on their own they do not compete well with existing plants.

Practices that slow the growth of the existing turf prior to and after seeding have been suggested as ways to favor the new seedlings. This philosophy works when you're attempting to favor one species over another, especially in the case of overseeding a warm-season turfgrass with a cool-season turfgrass in the autumn when the warm-season turfgrass is entering dormancy. The dormant warm-season turfgrass won't compete much during the winter. But how do you favor one cultivar of bentgrass over another? How can germinating bentgrass seedlings compete with an established stand of bentgrass? Mowing at a lower height of cut should tend to favor the newer creeping bentgrasses, but does this provide enough advantage for a seedling to out-compete an established plant of the same species? Our results suggest that it doesn't.

We would suggest that for interseeding to be successful, the existing creeping bentgrass would have to be severely stressed and a significant amount of the turfgrass canopy removed. Practices such as a severe scalping of the turf may reduce the competitiveness of the existing bentgrass to a level that the new cultivar would have a chance. Practices that destroy the turf canopy and create open spaces could reduce competition from the existing creeping bentgrass plants and allow the new seedlings to develop. Further studies need to be conducted to develop effective procedures for interseeding, but given our results and current interseeding procedures, introducing a new cultivar is best accomplished through total renovation.

If interseeding was successful, the dispersal of the new cultivar within the existing stand needs to be addressed. In other ecological systems, the introduction of a new species results in a patchy appearance indicating non-uniform introduction of the species. Will the same quilt-like transition occur when one cultivar is introduced into another? We suggest that greens with patches of various bentgrasses would not be desirable and that management of such a green would be difficult.

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