# Diamond NOT in the Rough

## Current research at Clemson University explores use of Diamond zoysiagrass on putting greens.

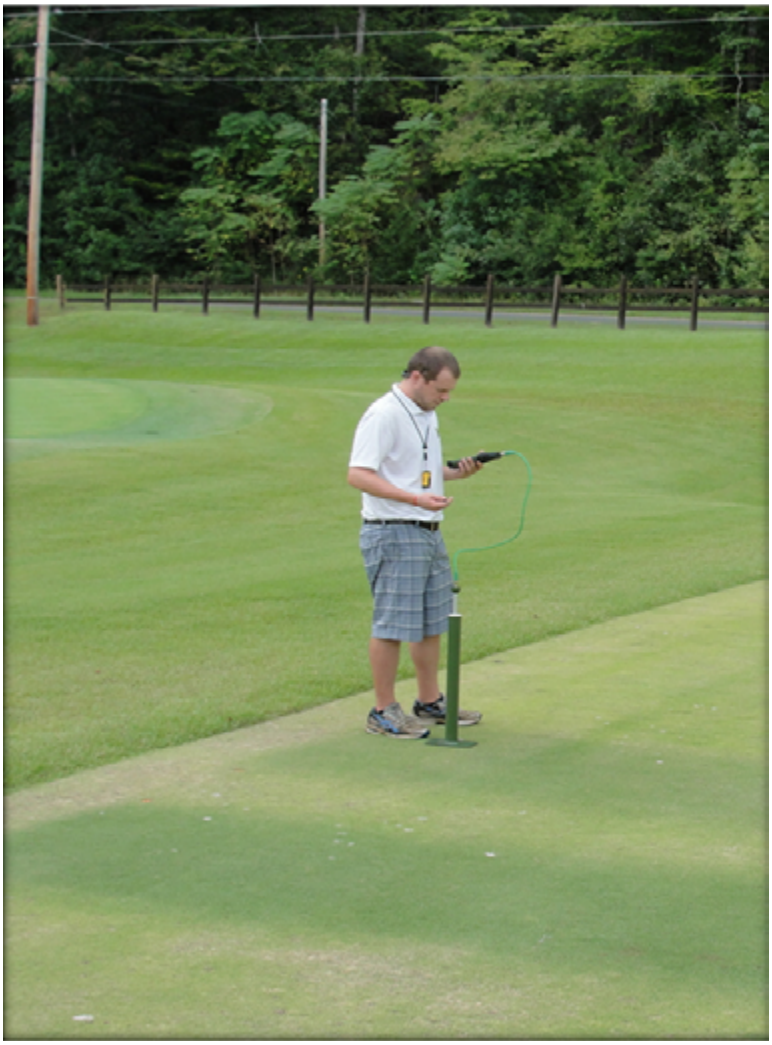
BY NICK MENCHYK, FRANK BETHEA JR., AND DR. HAIBO LIU

The list keeps on growing. There are at least four turf species available for putting greens in the Southeast Region today: ultradwarf bermudagrass, creeping bentgrass, seashore paspalum, and zoysiagrass. Zoysiagrass? Yes. Diamond zoysiagrass is a variety released by Dr. Milt Engelke at Texas A&M University in 1996, and it has been planted on the putting greens at several golf courses in recent years.

Currently, the niche that Diamond appears best adapted to in the Southeast Region is on putting greens that receive too much shade for an ultradwarf bermudagrass to prosper and an inability to increase sunlight levels through removal of trees. Clemson University has embarked on numerous projects to better understand and identify best management practices for Diamond zoysiagrass to produce desirable putting conditions.

The remainder of this article will evaluate research at Clemson University in the following areas:

- Establishment
- Shade Tolerance
- Fertility Inputs
- Plant Growth Regulator Use
- Putting Green Performance



*TruFirm readings were taken monthly to measure Diamond zoysiagrass putting green surface firmness.*

### ESTABLISHMENT

One of the advantages of converting to an ultradwarf bermudagrass putting green is its relative ease through no-till and quick establishment methods. A potential concern of using Diamond zoysiagrass as a putting green is its slow establishment rate. Currently, there is a lack of research to explore establishment techniques of Diamond zoysisgrass. However, previous research at Clemson demonstrated that Diamond can be established from sprigs in one growing season and meet putting green expectations within 12 weeks. The time required for establishment can be reduced with sprigging rates greater than 24 bushels/1,000 sq. ft. and total nitrogen input between 4-7 lbs. N /1,000 sq. ft. / year. Although slower than ultradwarf bermudagrass establishment, there are added benefits of Diamond as a putting green, which will be discussed further.

### SHADE TOLERANCE

When making the switch from creeping bentgrass to ultradwarf bermudagrass, additional attention is necessary to evaluate potential shading problems associated with the surrounding landscape. Removal or aggressive pruning of trees is a standard practice to ensure that ultradwarf bermudagrass putting greens receive proper amounts of sunlight. Diamond exhibits superior shade tolerance over ultradwarf bermudagrasses, which translates into reduced tree work and preservation of the existing golf course. A recent study conducted at Clemson examined the shade tolerance of Diamond under varying levels of shade and trinexapac ethyl (Primo) applications. Diamond displayed acceptable turf quality under constant levels of 60% shade without

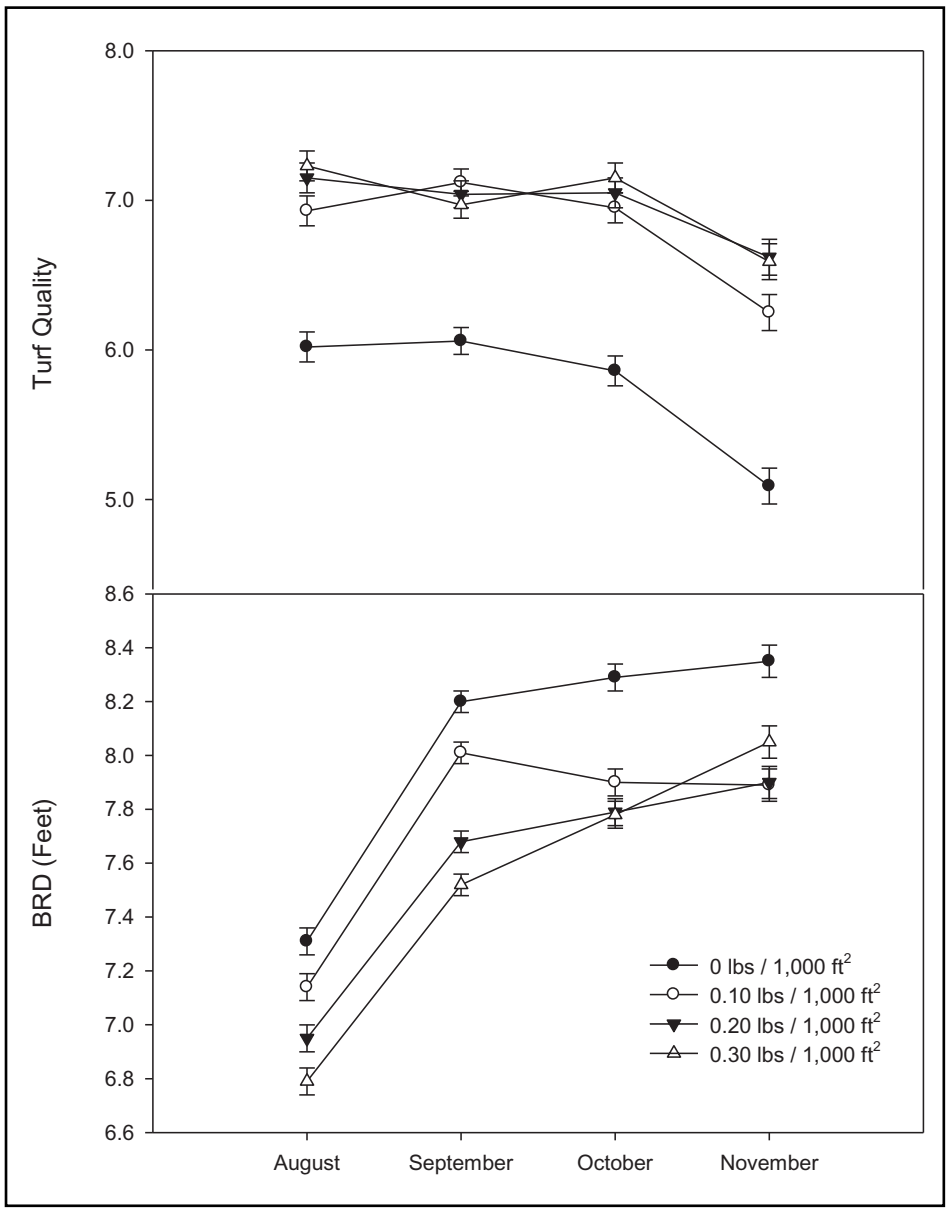



*Figure 1. Diamond zoysiagrass turf quality (1-9 scale, where 9 = perfect turf and 1 = dead turf) and ball roll distance as affected by nitrogen level and time.*

weekly applications of Primo during the growing seasons of the two-year study, indicating its strong shade tolerance. However, turf quality improvements were found at 60 % and 90% shade with weekly Primo applications at 1.5 oz./acre during the growing season.

## FERTILITY INPUTS

Other recent research work conducted by Clemson examined Diamond putting green performance over two years under weekly applications of foliar-applied nitrogen and Primo at the Cliffs turfgrass research facility, in Marietta, S.C. Weekly readings of turf quality and ball roll distance were performed, as well as monthly thatch accumulation and surface firmness measurements using the USGA TruFirm™. These parameters provided the first look into the management practices necessary to meet golfers' expectations and overall sustainability of Diamond putting greens in the transition zone.

## PLANT GROWTH REGULATOR USE

Results of this study found that management of fertility and Primo significantly influence the putting green performance of Diamond. Weekly applications of 0.20 lbs./1,000 sq. ft. ammonium nitrate with Primo at 2 oz./acre provided acceptable turf quality and significantly increased ball speed and firmness. Although increased nitrogen (N) rates led to higher turf quality ratings, performance as a putting surface suffered as indicated by ball roll distance (Figure 1). A significant decrease in ball roll distance occurred as weekly N rate increased. This response also was exhibited for surface firmness when measured using the Trufirm. As weekly N level increased, surface firmness readings decreased. This is possibly due to a greater shoot density and increased vertical growth, leading to slower ball roll distances and increased TruFirm penetration. Soil moisture readings were not taken during this study and could significantly impact surface firmness of Diamond putting greens. Thatch depth increased throughout the growing season of both years. However, there wasn't correlation between total N input and thatch depth. A commonly recommended rate of 3 lbs. N / 1,000 sq. ft. / year is a suitable fertility level for most zoysiagrasses in the Southeast, and findings of this study support this recommendation. Nitrogen inputs in excess of 3 lbs. may lead to poor putting green performance; however, supplemental applications of quick-release N sources should be conducted to promote growth and recovery. A decrease in mowing height, increase in PGR application rate or frequency, rolling, and cultivation could increase ball roll distance on Diamond putting greens. A common mowing height of 0.125" was used in this study, but previous research at Clemson demonstrated that Diamond could be mowed as low as 0.098" without scalping or winter survival issues. In addition, thatch and mat control studies for Diamond zoysiagrass putting greens need to be examined further. Throughout the two-year field study, no cultivation took place and significant increases in thatch depth were recorded.

## PUTTING GREEN PERFORMANCE

In summary, Diamond zoysiagrass has the potential to be installed and utilized

*Variations in Diamond zoysiagrass turf quality due to nitrogen fertility levels were apparent throughout the growing season. Darker green leaf tissue on the Diamond occurred with weekly treatments of foliar applied nitrogen and Primo.*

successfully in the southeastern states as a putting green turfgrass alternative to bentgrass and ultradwarf bermudagrasses when shade issues exist and tree removal options are limited.

Optimal fertility and pest control programs need to be investigated to maximize putting green performance without compromising turf quality and overall plant health. Additional research needs to be conducted to examine cultivation, lowered mowing heights, increased PGR rate/application intervals, and surface rolling to further enhance putting green performance. Although the future looks bright for Diamond, many questions need to be answered. Diamond does, however, seem to have a niche at certain locations in the Southeast Region where shade is an issue and current putting green turfgrasses won't work.

*Diamond zoysiagrass putting green responses to shade and Primo. Left, 90% shade without Primo. Right, 90% shade with Primo. (Photo by Jeff Atkinson)*

## ACKNOWLEDGEMENTS

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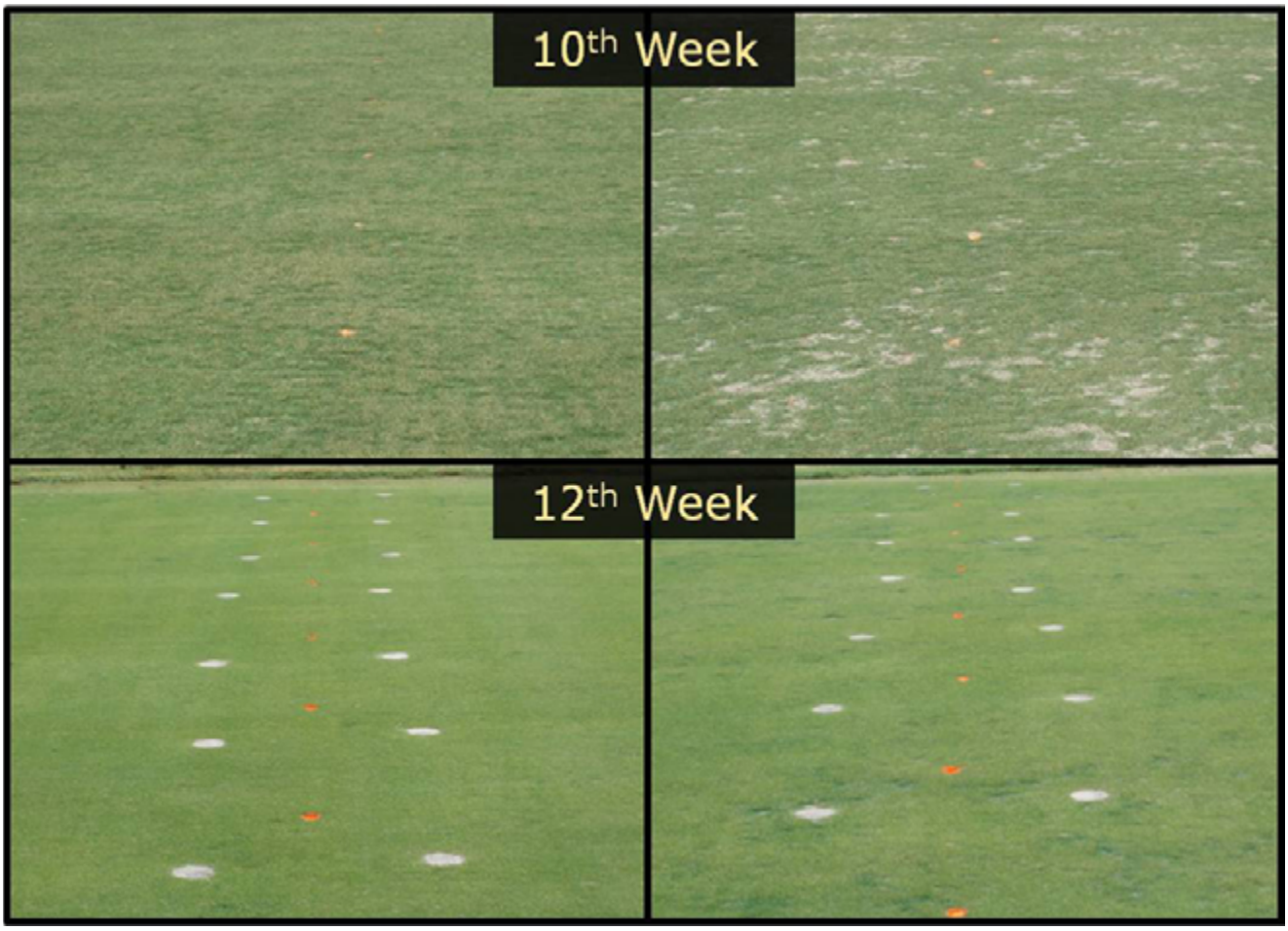


*Diamond establishment time is affected by sprigging rate. Regardless of sprigging rates of 24 bushels/1,000 sq. ft. (two photos on the right) or 48 bushels/1,000 sq. ft. (two photos on the left), Diamond putting greens were ready within 12 weeks. (Photo by Brandon Stiglbauer)*

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