2016-08-608

Breeding for Resistance to Winter Dormancy in Bermudagrass and Zoysiagrass

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Objectives:

1) Develop germplasm and cultivars of bermudagrass that are winter dormant resistant.

2) Develop germplasm and cultivars of zoysiagrass that are winter dormant resistant.

Start Date: 2016
Project Duration: 5 years
Total Funding: $150,000

The Florida turfgrass industry is among the largest and most dynamic turfgrass industries worldwide. Florida has more golf courses and acres in sod production than any other state in the U.S. In 1992, within the state of Florida, over $7 billion was spent for production, distribution and use of turfgrass products. These expenses included costs associated with seed, sod, pesticides, fertilizers, equipment, labor, and professional services (Hodges et al., 1994). At $307 million, yearly sales of turfgrass in Florida account for 14% of total horticultural products and services purchased. (Hodges and Haydu, 2002). However, the industry is facing challenges due to imposed water and fertilizer restrictions. To aid golf course superintendents and ensure the continued growth of golf in Florida, better turfgrass cultivars are needed. Here we propose to improve two warm-season genera of turfgrass with the major objective to screen and breed new cultivars that lack an ability to enter winter dormancy. Sub-objectives for improvement include sting nematodes, drought and large patch resistance.

In 2016, an Advanced Bermudagrass trial was planted with 84 total entries. Five entries are commercial controls (Tifway, Celebration, Latitude 36, Tiftuf and Bimini), 8 entries were advanced from a collection of lines obtained from golf courses in south Florida, and 71 lines are from the breeding program. These plots matured through most of 2017 and data collection began in late 2017 to focus on identifying entries that grow and maintain quality through winter. Differences in response to freezing temperatures have been rated (Figure 1). Figure 2 compares the top six overall experimental lines compared to the five commercial cultivars. FB1628 maintained quality through cooler temperatures compared to FB1629 which declined in turf quality in response to reduced temperatures. The changes in turf quality from 8 December to 15 December were the result of several nights with temperatures in the 30s with a freeze occurring 11 December. Figure 3 shows that experimental lines with the best turfgrass quality were also able to maintain acceptable average density through the fall of 2017. The best lines from this study will be replanted in a smaller study for further evaluation. The lines will also be utilized in new crossing blocks.

In 2016, seed was germinated to produce a new population of bermudagrass that resulted in 369 new progenies planted in a single-rep, spaced plant nursery. These matured through 2017 and data collection focused on the identification of those entries that grow and maintain quality through winter. The best lines will be replanted in a replicated study with larger plots.

In the spring 2017 seed were collected from two crossing blocks. One crossing block is made up of

advanced lines of common bermudagrass and an elite African bermudagrass, and the second crossing block contains finer textured forage selections previously identified for their lack of dormancy symptoms through winter along with other advanced lines of African bermudagrass. Seed set was extremely poor for both crossing blocks as attempts to geminate harvested seed produced only one or two seedlings. These crossing blocks remain in place and seed will again be harvested in 2018.

In 2016, 88 advanced zoysiagrass entries were planted as part of a USDA-SCRI project at six locations in five states to asses their drought performance. Data is not available from this broader project, but differences in winter performance have been observed. An additional 50 entries are under evaluation in Citra, FL. The majority of these are fine-textured lines with potential uses ranging from golf course putting greens to fairways.

In the fall and spring of 2016 and 2017 crosses were made among elite lines of zoysiagrass that show improved drought tolerance and winter turfgrass performance. These efforts produced over 2,600 new progeny that were planted in the summer of 2017. Lines showing resistance to dormancy will be selected for continued crosses and lines showing persistence after three years will be selected from this population for further evaluations.

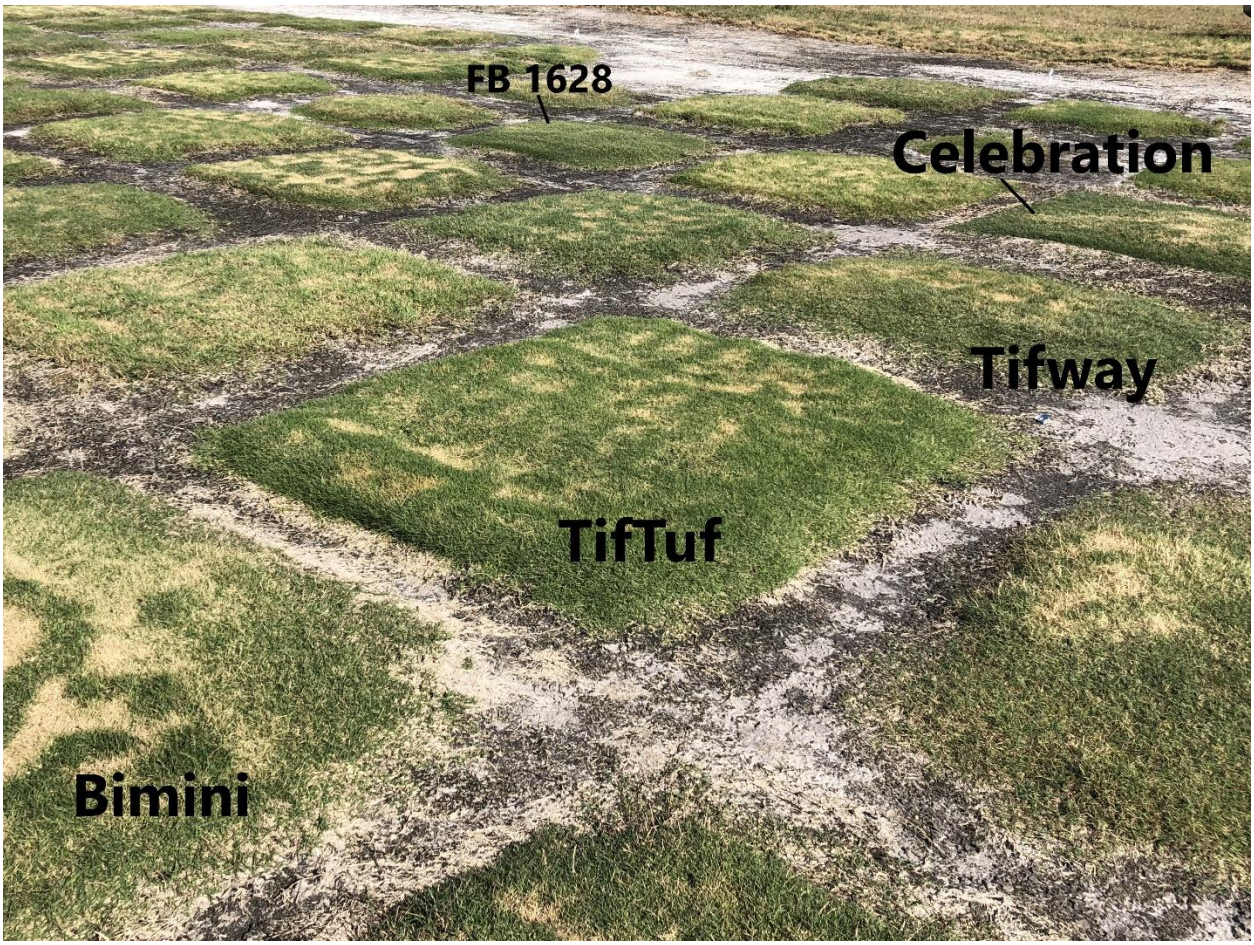

Figure 1. Responses of four commercial bermudagrass cultivars and an experimental line to freezing temperatures. The picture is 10 days after exposure to freezing temperatures.

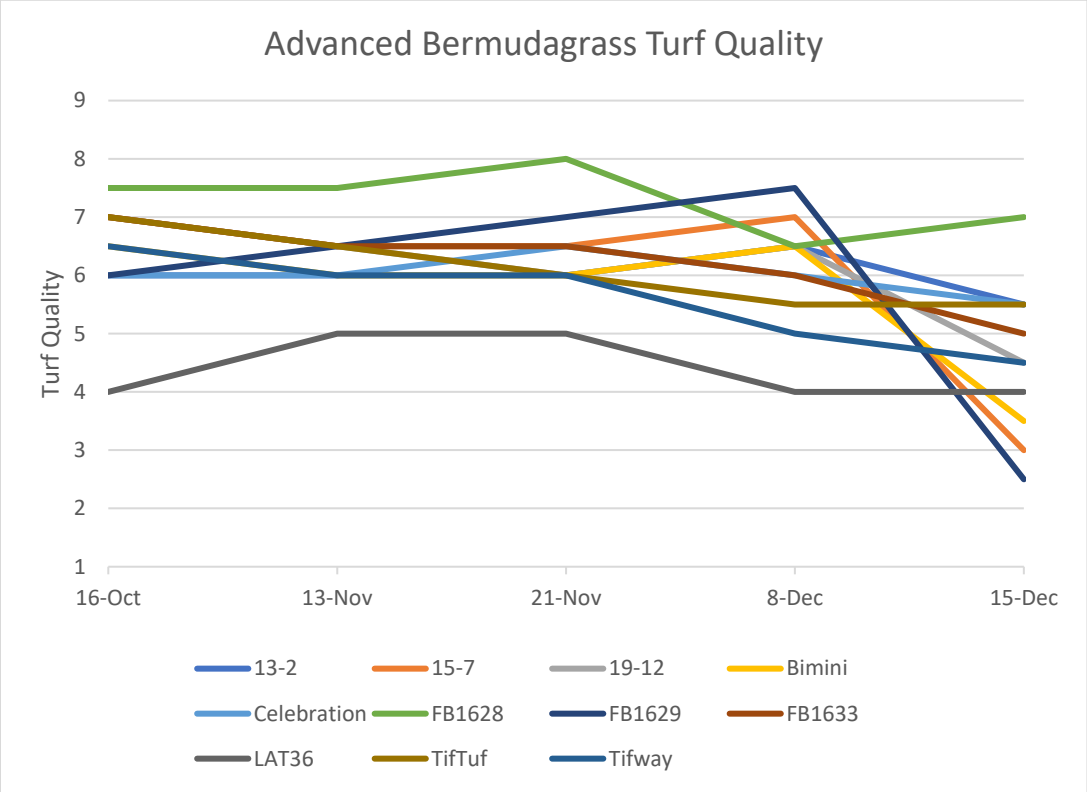

Figure 2. Comparison of the average six best performing experimental lines compared to five commercial bermudagrass cultivars.

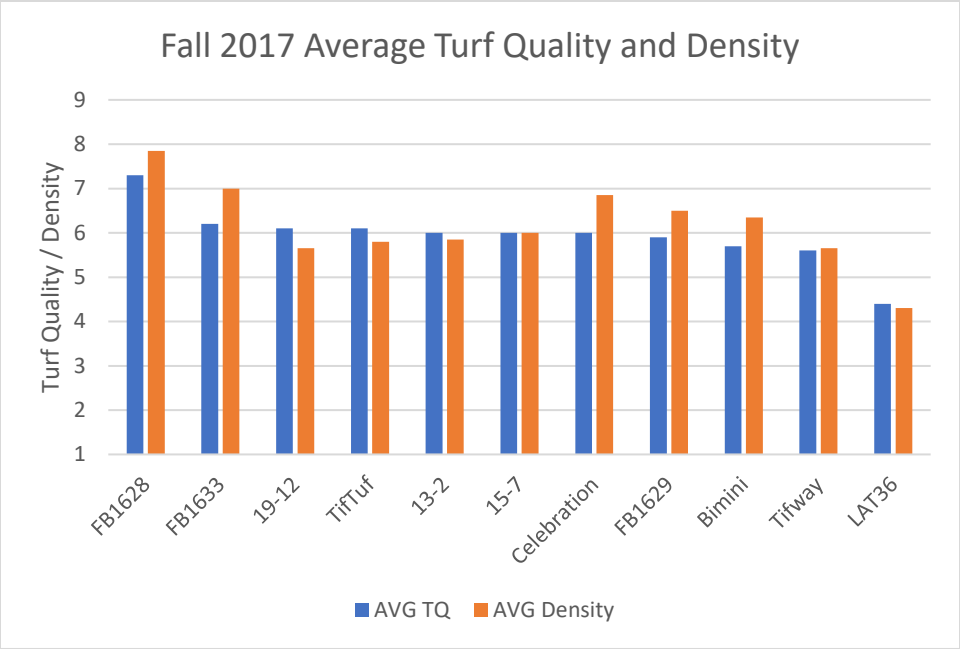

Figure 3. Fall 2017 average Turfgrass Quality and Density of the best six lines (based on TQ) compared to five commercial cultivars of bermudagrass