Production and Maintenance of Triploid Interspecific Bermudagrass Hybrids for QTL Analysis

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Objectives:

1. To evaluate the B17 F1 mapping population in replicated tests at Tifton, GA and Griffin, GA for turfgrass performance characteristics with the goal of identifying quantitative trait loci (QTL) for these traits.
2. To increase the size of the B17 F1 mapping population to 200 or more individuals.

Start Date: 1999
Project Duration: ongoing
Total Funding: $120,000

A framework genetic map was created using single-dose restriction fragments (SDRF) by Bethel, Sciara, Estill, Bowers, Hanna, and Paterson in 2006. In 2010, 75 simple sequence repeat (SSR) and 70 expressed sequence tag (EST) markers were identified to assess genetic diversity, identify cultivars of bermudagrass including those cultivars derived from 'Tifgreen', confirm pedigrees, and differentiate contaminants from cultivars. In the field, two replicated field trials of the B17 F1 mapping population were planted in Tifton and Griffin, GA to assess the phenotypic variation of these bermudagrass plants as observed in two distinct environments.

A number of traits will be measured or estimated in Tifton and/or Griffin, GA over the duration of this experiment. They include the length of the longest stolon during grow-in, stolon internode length, leaf width, leaf length, plant canopy height in the absence of mowing, seedhead density, number of racemes per flower, raceme length, number of spikelets per raceme, % green color, genetic color estimated with digital image analysis, plot color, turf density, turf quality, spring green-up, fall dormancy, and the variation of anthocyanin content between individuals within the mapping population.

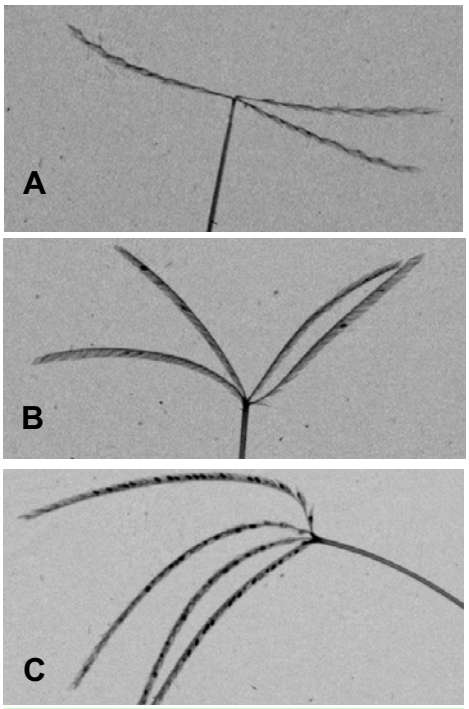

Figure 1. *X-ray images were used to estimate percent seed-set of bermudagrass genotypes. (A) triploid 'TifSport 'bermudagrass: no seed. (B) tetraplid 'Tifton 11' bermudagrass: 2 seeds (C) tetraploid T89 bermudagrass: 47 seeds*

The majority of our efforts during 2011 were focused on measuring stolon internode length (1,134 measurements), leaf width (1,134 measurements), plant canopy height (378 measurements), seedhead density (counted seedhead number in a 1' × 1' sample area on 756 plots), number of racemes per flower (records on 1,134 seedheads), raceme length (approximately 3,402 measurements), number of spikelets per raceme (counting between 30 and 250 spikelets on 1,134 seedheads), % green color (1,512 digital pictures evaluated), genetic color (1,512 digital pictures evaluated), turf density (1,512 ratings), and fall dormancy (756 digital pictures will be evaluated).

The majority of these measurements and ratings are finished, but have not yet been entered into spreadsheets. Seedhead morphological characteristics will be measured this fall and winter on samples which were collected at maturity during the growing season and have been dried down for long-term storage.

Figure 1 illustrates a technique used in the turfgrass breeding program at the University of Georgia to estimate percent seed-set of bermudagrass genotypes using X-ray images. (A) Triploid 'TifSport' bermudagrass: no seed. (B) Tetraploid 'Tifton 11' bermudagrass: 2 seeds. (C) Tetraploid 'T89' bermudagrass: ~47 seeds.

T89 × T574 hybrids were germinated and planted in the field during 2011.

Work continues to increase the B17 F1 mapping population by making hand pollinations between T89 and T574. During 2011, 256 new hybrids were germinated and planted from 2010 crossing efforts. Lab analysis has not yet been completed to determine what percentage of these new hybrids are truly T89 × T574 crosses. To reach our goal of a mapping population of 200, only 60 of the 256 new hybrids (~25%) will need to be identified as hybrids and not self-pollinations.

Additional crosses were made again in the spring of 2011. The seed has been harvested and will be planted out in the greenhouse this winter in an attempt to increase the B17 F1 mapping population well beyond the goal of 200 individuals.

Summary Points

- 14,364 different measurements, counts, or ratings were made on individuals of the B17 F1 mapping population in replicated tests planted on the Tifton and Griffin Agricultural Experiment Stations during 2011.
- 256 new hybrids were germinated from 2010 T89 × T574 crosses.
- Approximately 1,000 seed were harvested from T89 × T574 crossing efforts conducted in the spring and early summer of 2011.