Development of Seeded Turf-type Saltgrass Varieties

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Objectives:

1. Evaluate C_2 population. Select parents from these and intercross for the Cycle 3 population.
2. Evaluate segregation of elite crosses.
3. Evaluate inbreeding of closely related crosses.
4. Screen parents for ploidy level.
5. Screen for salinity tolerance.

Start Date: 2006
Project Duration: three years
Total Funding: $78,822

Conserving water in the landscape is critical to inhabiting the arid portions of the western United States. Native accessions of the inland form of saltgrass (*Distichlis spicata* var *stricta* (Torr.) Beetle) remained green, while turfgrass lines of blue grama, buffalograss, crested wheatgrass, and bermudagrass went dormant from lack of rainfall during the drought of 2000 and 2001.

Since saltgrass is non-domesticated, this research improves native germplasm by selecting for specific traits in order to make saltgrass more turf-like. We continued evaluation of the C_2 population, with measurements of height, rust rating, general verdure, leaf shredding, and seed yield. In addition, this year we screened turf types for salinity tolerance.

For salinity screening, the germplasm was approximately 70 lines (from 3,000 lines) in the C_2 nursery that had been chosen for general turf quality in 2008 (high shoot density, short height, and desirable appearance under drought). Line COAZ-01 was used as a check since Qian had found it, compared to other accessions, to have high turf quality, low leaf firing, high root growth, and high root viability across a range of salinity levels (12, 24, 36, 48 mmhos/cm).

Four plugs (16 cm in diameter and 16-cm deep) were dug for each line, potted, and acclimated for four weeks in tubs maintained at 2.5-cm depth of tapwater (0.8 mmho/cm, mountain stream source). Since saltgrass is a phreatophyte, sitting in water is assumed to have little effect on growth. At the end of four weeks, two plugs of each line were placed in salinity (12 mmhos/cm derived from commercial aquarium sea salt) tubs, with the solution at a 2.5 cm depth. Salinity was monitored and maintained daily. Every three days, a pump was used to manually water the surface of the pots to equilibrate the soil salinity with the saline solution.

After two weeks, the saline solution was raised to 36 mmhos/cm. Several days afterwards, many plants took on a darker green appearance than their counter parts in the tapwater tubs. We increased the the salinity solution over two weeks to 48 mmhos/cm. Two weeks after the 48 mmho/cm threshold, plants in the saline treatments were compared to their counter parts in the tapwater treatment and assigned a number based on:

1. green=control color
2. darker green
3. darker green with leaf tips burned
4. attributes in 3 and dieback of male or female head shoots
5. half or more of all shoots dieback.

Eight lines showed no change in color, and were significantly different than the bottom ranked 23 lines. A total of 26 lines ranked higher than COAZ-01, which is considered to have excellent salinity tolerance. These results suggest a correlated response in salinity tolerance by selecting for turf traits (short height, rust resistance, shoot density, and seed yield) in saltgrass. Plants ranked high in salinity tolerance will be considered for parents.

We use a selection index in order to rank plants for selection as parents. In the first cycle, this took the form of the selection value of an individual line=(standardized spike numbers) + (standardized shoot density) - (standardized height) - (standardized rust rating). Standardization equalizes the scale between traits. The top 30-40 lines are then selected as parents.

Parents will be brought into the greenhouse this winter and induced to flower, and all crosses will be made between parents. Seed will be harvested, germinated in April in growth chambers, and theses will form the C_3 nursery. Seed of elite crosses will be germinated in growth chambers over winter, grown out in the field, and observed for segregation of turf traits.

Plants on the left were at 48 mmhos/cm for two weeks and assigned a number 4 class. Plants on the right were grown with tapwater. All pots are the same genotype.

Summary Points

- Salinity tolerance screening resulted in 26 lines ranked higher than the previously preferred check.
- Parents are selected for winter crossing to produce a progeny population with improved turf traits.
- The breeding population with a genome of 38 chromosomes is being maintained.