Development of Seeded Turf-type Saltgrass Varieties

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Objectives:

1. Evaluate new collections and Cycle 2 population. Select parents from these and intercross for the Cycle 3 population.
2. Screen the collection for rhizome depth.
3. Evaluate selection's potential for commercial seed harvest.
4. Correlate meristems to plant size.

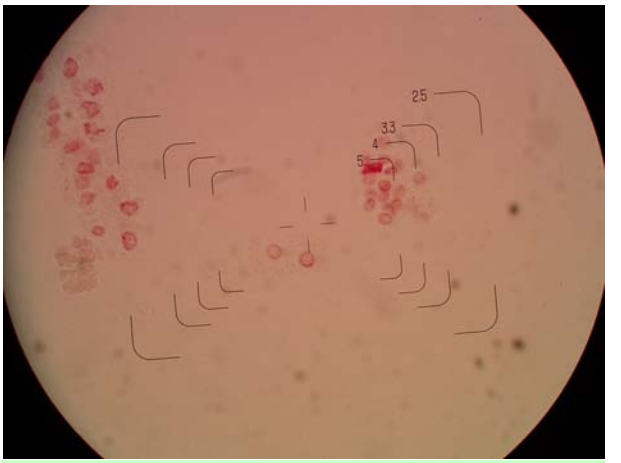
Start Date: 2006
Project Duration: three years
Total Funding: $78,822

Golf courses in western North America have limited water supplies, poor water quality, and soils that are arid, alkaline, and salty. Inland saltgrass (*Distichlis spicata*) is native to this area and shows potential as a turfgrass. Under hot, dry conditions, saltgrass remained green, while bermudagrass, buffalograss, and blue grama went dormant. Under high traffic, saltgrass does not die out, but instead grows short, petite, with increased shoot density.

We screened the breeding parents for chromosome numbers to maintain the population to ensure having 38 chromosomes. Rapidly growing root tips are excised from plants. Treating with colchicine arrests cell division at metaphase, then the cells (tips) are treated with a fixative, then stained with acetocarmine. The darkly stained area is dissected and recovered for digestion with the enzymes cellulase and pectinase to free the cells from the cell wall.

After digestion, the material is gently vortexed to break up inner cells from the outer root wall. A spreading mixture is added. Small droplets are dropped from about 10 cm in height onto frozen microscope slides to disperse cells into a single layer on the slide for critical viewing. We find this to be far superior to squashes, especially given the extremely small chromosome size in saltgrass, which requires near perfect mounts for viewing.

Counts are made at 1200X, approaching the optical limits of microscopy. At this magnification, counts are made by hand drawing of the chromosomes in the nucleus. Ten cells are drawn per parent or accession to confirm chromosome numbers. Scott Reid's thesis showed 38-40 series predominates, but there are significant numbers of 72-76 plants widely distributed, and some 56 types.



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The seed from crosses had the distal end cut by hand to overcome dormancy. In commercial practice this is accomplished by scarifiers or deburring machines. However, seed from hand crosses are so few and important, they are individually treated. Roughly 150 lots were excised corresponding to the number of handcrosses carried out in the winter greenhouse and field. The growth chamber was set for 16 hour days, with 90^{o} F days and 60^{o} F nights, optimal for saltgrass germination.

Seedling harvests were taken at weekly intervals for a month, planted into 1-inch cells, and grown at 75^{o} 18-hr days. At the 5-leaf stage they were moved to the greenhouses and transplanted to 2-inch cells. The roughly 2,000 progeny were planted into the field the first week of August 2007 and immediately irrigated.

In October of 2006, 2,000 plugs measuring 10 inches deep and 6 inches square were dug to locate the horizontal rhizome mass (where growing shoots originate) in each plant. In saltgrass, this averages 6 inches below the surface. However, the data analysis shows that by breeding for seed yield, short height, and shoot density, a correlated response occurred by moving the horizontal rhizome mass closer to the soil surface. Shallow root systems are necessary for sod harvesting.


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Summary Points

- Parents and some accessions were screened for chromosome numbers to keep the working population number at 38.
- Seeds from hand crosses were carefully nicked to overcome dormancy, germinated, and grown in growth chambers overwinter. New nursery of 2,000 progeny was planted in August 2007
- It was discovered that rhizome depth is made shallower by selecting for seed yield, short height, and shoot density.