

Multiple Stress Tolerance, Seed Dormancy Breaking, and Establishment of Seeded Saltgrass

Yaling Qian and Dana Christensen
Colorado State University

Objectives:

1. Quantify cold hardiness of potential varietal releases and advanced seeded lines.
2. Continue to determine the level of salinity tolerance during germination (seeded type only) and as mature turf for potential new cultivars.
3. Evaluate different seed treatments to break seed dormancy.
4. Evaluate saltgrass seeding establishment in the field with high and moderate levels of soil salinity.
5. Determine saltgrass rooting characteristics and soil moisture extraction patterns under two irrigation regimes.

Start Date: 2006

Project Duration: three years

Total Funding: \$72,036

Due to its exceptional salinity tolerance, inland saltgrass has great potential for use as a turfgrass and revegetation species of saline sites. However, saltgrass seeds have a low germination rate due to seed dormancy.

Three experiments were conducted to evaluate different seed treatments to enhance germination and establishment of inland saltgrass. In Experiment I, eight different seed treatments were tested for their ability to enhance germination percentage in the growth chamber. These treatments included treatments with hot water, hydrogen peroxide (H_2O_2), sulfuric acid (H_2SO_4), potassium nitrate (KNO_3), bleach, machine scarification, stratification, hand nicking, and the control. Results indicated that germination percent-

age was increased only by stratification, hand nicking, and machine scarification treatments compared to the control.

In Experiment II, machine scarification, stratification, hand nicking, and the control were tested in the growth chamber. Hand nicking, scarification, and stratification increased percent germination from 13.0% to 54.0-61.7%. Stratification resulted in the fastest germination, followed by hand nicking and scarification.

Experiment III was conducted in the field (soil EC was about 5.0 dS/m), and seed treatments included machine scarification, stratification, and the control. Two months after seeding, plots seeded with stratified and scarified saltgrass seeds established adequate plot coverage as a turf, whereas the coverage for the control was inadequate. From this study, we concluded that stratification and machine scarification improve germination and establishment of seeded saltgrass.

A study was initiated to determine saltgrass rooting characteristics, soil moisture extraction patterns, and water use rate of saltgrass in the field under two irrigation treatments. The two irrigation treatments consist of: I) irrigating once every two weeks at 40% (estimated) Kentucky bluegrass water use rate, and II) irrigating with two inches of water when saltgrass exhibits significant drought stress symptoms. Neutron probe tubes allowed measurements of soil water content at 30 cm increments to 270 cm below soil surface. Soil water content changes during periods of dry downs allowed us to calculate saltgrass water use rate.



Field studies also showed that saltgrass used only 46-50% of estimated water use of Kentucky bluegrass.

From this year's data, we have found that saltgrass root system reached 240-270 cm below soil surface in the field. When available water was present, saltgrass extracted most of the water from the surface layers (0-30 cm). When soil available water in the surface layers was depleted and grass exhibited mild stress symptoms, saltgrass extracted water 180-270 cm in the soil profile.

The average water use rates of saltgrass were 2.8 and 3.0 mm per day for irrigation treatments I and II, respectively, during 7 measurement periods this year. This represents about 46-50% Kentucky bluegrass ET.

Summary Points

- Cold moist stratification and dry scarification significantly improved germination and enhanced establishment of seeded saltgrass.
- When available water was present, saltgrass extracted most of the water from the surface 30 cm.
- When available water in the surface layer was depleted and grass exhibited mild stress symptoms, saltgrass extracted water 180 - 270 cm deep in the soil profile.
- The average water use rate of saltgrass was about 46-50% of estimated Kentucky bluegrass ET.



From field studies it was found that stratification and machine scarification improve germination and establishment of seeded saltgrass.