Nitrogen Nutrition of Distichlis *(Saltgrass) under Normal and Salinity Stress Conditions Using ^{15}N*

Mohammad Pessarakli
University of Arizona

Objectives:

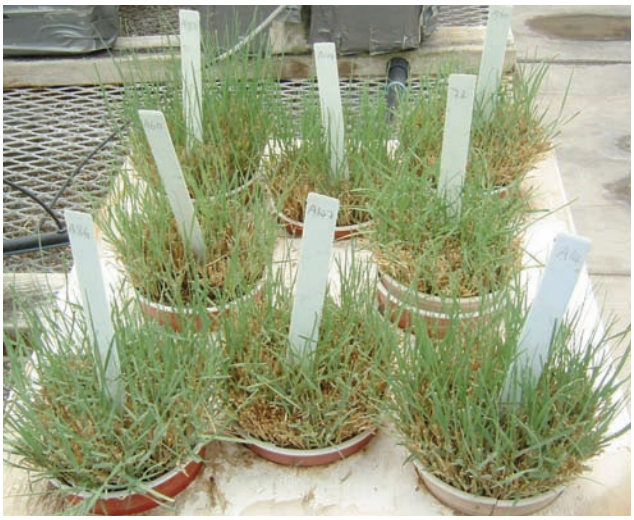
1. To determine nitrogen uptake of saltgrass under salt stress conditions using ^{15}N.

Start Date: 2008
Project Duration: two years
Total Funding: $6,000

Saltgrass (*Distichlis spicata*) is a warm-season potential turfgrass species that has the ability to grow under highly saline, poor soil conditions, and with limited available water and nutrient (i.e. nitrogen) sources. This characteristic could prove to be beneficial in certain turfgrass areas requiring low maintenance in arid regions with saline soils and limited water or low fertility/limited nutrient contents and poor soil conditions. Growth of this species could be important to aid in conservation of water and nutrients and use of salt-affected soils. Test of the species' ability to grow under highly saline conditions and limited nutrients, as well as low available water sources, are needed before it can be applied to a turfgrass system.

Twelve saltgrass genotypes (A37, A49, A50, A60, 72, A86, A107, A126, A136, A138, 239 and 240) collected from several southwestern states of the United States were studied in a greenhouse to evaluate their growth in terms of shoot and root lengths and dry mater (DM) weights (shoot clipping weight) and nitrogen (^{15}N) uptake under salt stress condition. The grasses were grown under saline (NaCl) conditions at EC of 20 dSm^{-1} using a hydroponic technique using Hoagland solution. A randomized complete block (RCB) design trial was used with four replications of each genotype and each treatment. Nitrogen (^{15}N) was used to determine the exact amount of N taken up by the plants.

Each week, the plant shoots (clippings) were harvested for the evaluation of the dry matter (DM) production. At each harvest, both the shoot and root lengths were measured and recorded. The harvested plant materials were oven-dried at 60ºC and DM weights were measured and recorded. Six harvests were included in the experiment. The ^{15}N samples for only one harvest were analyzed. At the termination of the experiment, plant roots were also harvested, oven-dried at 60º C and DM weights were measured and recorded.



Grasses were grown under saline (NaCl) conditions at EC of 20 dSm^{-1} using a hydroponic technique using Hoagland solution.

The results of the average shoot length per week showed a decrease in all varieties of plants grown under saline condition compared to the control. The root length for the duration of the experiment showed increased root growth of eight of the twelve varieties grown under saline condition when compared to the control. These eight varieties include A60, A86, A107, A126, A136, A138, 239 and 240.

All varieties, except A86, produced a higher weekly average fresh weight for control plants than those grown under saline conditions. The fresh weight of the roots showed an increase in six of ten of the varieties (A49, A86, A107, A126, A136 and 240) for the plants grown under saline conditions. Two of the varieties, A138 and 239, did not produce recordable root fresh weight.

The grass DM weight showed an increase in ten of the twelve varieties (A37, A50, A60, 72, A107, A126, A136, A138, 239, 240) and in the control plants in comparison to those grown under saline conditions. However, the percent DM weight of the shoots (average dry weight/average fresh weight) showed an increase in nine out of the twelve varieties (A49, A50, A60, 72, A86, A107, A126, 239 and 240) in the plants grown under saline conditions compared to the control, with variety A136 being equal under the both salt conditions.

Root DM weight showed an increase in eight of the ten varieties (A49, A50, 72, A86, A107, A126, A136 and 240) grown under saline conditions. The percent root DM (average dry weight/average fresh weight) showed increased DM production in seven of the ten varieties (A37, A50, A60, 72, A86, A126 and 240) grown under saline conditions.

The partial results of the ^{15}N analysis show a substantial increase in nitrogen concentration of the plant tissues. This indicates that saltgrass is a true halophyte and accumulates the extra N in its tissues which can be gradually available to the growing parts of the grass.

Summary Points

- The results of this experiment confirmed that saltgrass has a high salt tolerance and is a true halophyte.
- Root length, root fresh wt., root DM wt., percent shoot, and root DM wts. in plants grown under saline condition increased.
- The amount of DM produced is the most significant result as it is a direct representation of saltgrass' ability to grow under highly saline conditions.
- Based on the results of this experiment, each of the tested varieties had a high degree of salt tolerance.
- Based on the results of the ^{15}N analysis, all the clones accumulated significant amounts of nitrogen in their tissues under salinity stress condition.