Nitrogen Requirements of Various Saltgrass Genotypes under Salt Stress Conditions

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Objectives:

Compare nitrogen requirements (i.e., total-N and ^{15}N absorption) of various clones of saltgrass grown under non-saline and sal-stress conditions.

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Saltgrass (*Distichlis spicata*) is a warm-season potential turfgrass species that has the ability to grow under highly saline conditions with limited available water sources. This characteristic could prove to be beneficial in certain turfgrass areas requiring low maintenance such as arid regions with saline soils and limited water and nutrient availability.

Various saltgrass clones were studied in a greenhouse to evaluate their nitrogen uptake under normal (control, non-saline) and saline conditions (NaCl at EC 20 dSm^{-1}) using ^{15}N in a hydroponics system. Nitrogen-15 was used to find exactly how much nitrogen was taken up and partitioned between the roots and the shoots of the grasses under salt stress and control conditions.

The plants were grown vegetatively in polyethylene tubs containing half-strength Hoagland solution. A randomized complete block (RCB) design with four replications of each treatment was used in this study. The plants were allowed to grow in this nutrient solution for 6 months to reach full maturity and develop uniform and equal plant size. During this period, shoots were harvested weekly and the clippings were discarded. At the last harvest, roots and shoots were cut to have uniform roots and shoots prior to the initiation of the salt stress phase of the study.

The salt treatments were initiated by adding NaCl to the culture solutions to raise the electrical conductivity (EC) of the solutions 5 dS m^{-1} every other day until the final EC 20 dS m^{-1} was reached. The culture solution levels in the tubs were maintained at 10 liter volume, and solution conductivity was monitored and adjusted to maintain the prescribed treatment salinity level. After the final salinity level was reached, the shoots were harvested and the harvested plant materials were discarded

For both total-N and ^{15}N contents of the shoots, there were statistically significant differences found among the various clones under either the control or the salinity stress condition.

prior to beginning the ^{15}N treatment.

The ^{15}N treatment was started by adding 5 mg ^{15}N as 22.931 mg ammonium sulfate [$(^{15}NH_4)2SO_4$], 5.3% ^{15}N) per liter of the culture solution per day. After the ^{15}N addition, plant shoots were harvested weekly for determination of the ^{15}N absorption. The harvested plant materials were oven dried at 65° C and dry weights were measured and recorded. Six harvests were made. Plant shoots and roots were analyzed for total N and ^{15}N contents using an auto-analyzer and a mass spectrometer, respectively.

Except for 3 entries (clones A37, A136, and A138), the rest of the clones showed statistically no difference in their total-N contents under salinity stress as compared with the control plants. Nevertheless, all clones, except A86, had numerically lower total-N contents under salinity stress as compared with the control plants. Under the control condition, clone A138 statistically had the highest and clone A86 numerically the lowest total-N content. However, under stress condition, clone 240 had numerically the highest and clone A37 the lowest total-N content.

The ^{15}N content of the shoots did not follow the same pattern as the total-N content. For clones A37, 72, A136, A138, 239, and 240, there were statistically significant differences found in the ^{15}N contents of their shoots under salinity stress as compared with the control plants. The differences in the ^{15}N contents of the shoots of the rest of the clones were not significant between the salinized plants as compared with their corresponding controls.

Under control condition, clones A136 and A138 had statistically the highest and clone A107 numerically the lowest ^{15}N content. However, under the salinity stress condition, clones A138 and 240 had statistically the highest and clone A107 numerically the lowest ^{15}N content. As was observed for the total-N content of the shoots, all the clones, except A86, had numerically lower ^{15}N content under the salinity stress compared with the control plants.

For both total-N and ^{15}N contents of the shoots, there were statistically significant differences found among the various clones under either the control or the salinity stress condition.

Summary Points

- Most of the clones showed statistically no difference in their total-N or ^{15}N contents under salinity stress condition as compared with the control plants.
- Except for clone A86, the rest of the clones had only numerically lower total-N and ^{15}N contents under salinity stress condition as compared with the control (non-salinized) plants.
- Although the results showed satisfactory nitrogen (total-N and ^{15}N) uptake by the various saltgrass clones under this relatively high salinity stress level, there were some differences found among the various clones under both control and salinity stress conditions.