

Screening of Alfalfa (*Medicago sativa*) Cultivars for Salt Tolerance

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Alfalfa has been characterized as a moderately salt sensitive plant with a threshold of 2.0 dS/m electrical conductivity (equal to 1280 ppm) (Mass and Hoffman, 1977). Given the elevated levels of salinity of irrigation water in west Texas, screening of non-dormant cultivars under varying conditions and growth stages will assist both growers and breeders. Alfalfa cultivars were screened for salt tolerance in three experiments: Laboratory, Greenhouse and Field.

In the laboratory experiment, "Salt Tolerance of Germinating Alfalfa Seeds", plant germination was evaluated under increasing levels of salt concentration. Twenty-five seeds were placed in 100-mm Petri dishes under 5 concentrations NaCl [0.00, 0.50, 1.00, 1.50, and 2.00% (wt/wt) equivalent to 0 ppm, 5,000 ppm, 10,000 ppm, 15,000 ppm and 20,000 ppm dissolved salts respectively] in deionized water. Germinated and non-germinated seeds were recorded.

In the greenhouse experiment, "Forage Production Under Salt Stress", forage production was evaluated under irrigation with a saline and non-saline source. Varieties were planted in 4 cm x 20 cm cone-tainers and covered with 10 mm sand. All cone-tainers were irrigated for the first 14 days with 0.25X Hoagland's solution to ensure plant establishment. One group received non-saline irrigation treatment of the Hoagland's solution while the other group was irrigated with the Hoagland's solution and 3.5g/L NaCl (60mM or 3500 ppm) for the remainder of the experiment. Herbage was harvested (3 cm above soil) at 50 days after planting (DAP) and discarded. Herbage was then harvested at 30 day intervals and fresh forage weight recorded for each plant for a total of three recorded harvests. The study was replicated twice.

In the field experiment, "Production Under Saline Field Conditions", first-year forage production is reported under saline field conditions that exist at the Texas A&M University Agricultural Research Station west of Pecos, TX. All varieties were hand sown October 5, 2006 in a randomized complete block design with four replications. Groundwater used for irrigation had 2,598 ppm dissolved salts (4.06 mmho/cm) and average soil salinity was 575 ppm (0.89 mmho/cm). Plots were irrigated every 14 days during the growing season. Plots were harvested 7 times at 28 day intervals (with 42 days between cut 6 and 7) and fresh forage weights recorded.

Significant differences were observed in alfalfa cultivars in all three experiments with a variety of top ranking entries. Varieties that stood out among the three experiments include: AmeriStand 802, Salado, SW9720, FGR105BD101, CW59086 and AmeriStand 801S respectively. Permission for use of test cultivars was requested and granted. Correlation between experiments will be further explored and data subjected to regression analysis to evaluate trends as 2008 field data is collected and compiled.

References

Maas, E.V. and G. J. Hoffman. 1977. Crop Salt Tolerance - Current Assessment. J. Irrig. And Drainage Div. ASCE 103(IR2), 115.