

FORAGE PRODUCTION UNDER SALT STRESS

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Test author: S. E. Smith

BASIC PLANT CULTURE

All evaluations are conducted in a greenhouse

Container Cone-tainers, 4 x 20 cm

Medium Peat, perlite, sand, and organic potting mix, 2:3:3:4 by volume; 65 ± 5 g (dry wt.) per container leaving approximately 2 cm headspace

Temp/Light Best results at 22 to 30°C, with high light intensity and 24 hour daylength

No. of Plants 7 to 28 per replication in each salt treatment (saline and non-saline)

No. of Reps 2 to 4 replications in time

Other Inoculate with *Sinorhizobium meliloti* if common under local conditions; insect control as needed

SCREENING PROCEDURE

Establishment 3 to 5 scarified seeds sown per container and covered with 10 mm sand; thin to 1 seedling at 14 days

Irrigation Cone-tainers for each entry within each rep are placed in two groups; one group (half) receive saline irrigation, the other non saline irrigation; all containers receive only non-saline irrigation (0.25X Hoagland solution) for first 14 days; containers in the non-saline treatment receive this irrigation as needed for the duration of the test; containers in the saline treatment irrigated with 0.25X Hoagland solution + 3.5 g/L NaCl (=60 mM); irrigation solution should be applied so that foliage is not wetted.

Harvest Herbage is harvested (3 cm above soil) at 49 to 63 day post-planting (depending on temperature) and discarded; three additional harvests are made at 28 to 35 day intervals and fresh forage weight recorded for each plant; replications in time are suggested.

Leaching All cone-tainers are flushed with pure water (0.1 L/cone) after each harvest; this is followed by irrigation with appropriate nutrient solutions.

Symptoms This procedure should not produce symptoms of salt damage (marginal leaf burning or succulence).

CONTROL POPULATIONS

Tolerant

AZ-90NDC-ST*

Susceptible

AZ-88NDC*

*Check seed may be obtained from S. E. Smith.

Because of differences in greenhouse conditions and growth responses of germplasm tested, each experimenter is likely to observe slightly different results using this standardized procedure. The public cultivars Mesa-Sirsa, Saranac, and Malone are used as standards to allow comparison among trials at Arizona. The nondormant germplasm AZ-90NDC ST, which was selected for improved yield under salt stress, and its parental population AZ-88NDC (both released by University of Arizona) are also included as controls to evaluate relative severity of salinity stress.

DATA ANALYSIS

Forage production under saline stress is expressed as mean weight herbage produced with saline irrigation as percent of that under non-saline conditions (=Salt/Control ratio or SCR). SCR values are means of ratios for each of the three harvests over reps. Values are typically less than 1.0 and estimate regrowth salt tolerance. SCR values for control cultivars are generally between 0.6 and 0.75 in Arizona trials. SCR values expressed as proportion of mean SCR for the control populations allows comparison of SCR values between locations and years, although these should be interpreted with caution if control SCR values are < 0.5 or > 0.95. SCR values should be arcsine transformed before being subjected to ANOVA.

ALTERNATIVE METHODS

Field tests may be possible, but are generally unreliable because of extreme spacial and temporal variation in salinity stress.

SPECIAL CONSIDERATIONS

Environmental conditions permitting vigorous growth of plants under nonsaline conditions are essential. Avoiding low temperatures and insect infestations are especially important. Harvests of additional regrowths (up to fifth regrowth) can be taken to improve precision.

SCIENTIST WITH EXPERTISE

S. E. Smith

University of Arizona

Plant Sciences

Tucson, AZ 85721

(602) 621-5325

REFERENCES

1. Assadian, N.W., and S. Miyamoto. 1987. Salt effects on alfalfa seedling emergence. *Agron. J.* 79:710-714.
2. Johnson, D.W., S.E. Smith, and A.K. Dobrenz. 1991. Registration of AZ-90NDC-ST nondormant alfalfa germplasm with improved forage yield in saline environments. *Crop Sci.* 31:1098-1099.