

Forage Production Under Salt Stress

S. E. Smith

BASIC PLANT CULTURE

All evaluations are conducted in a greenhouse

Container Containers, 4x20 cm
 Medium Peat, perlite, sand, and organic potting mix,
 2:3:3:4 ratio by vol.; 65 ± 5 g (dry wt.) per
 container leaving approx. 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 *Rhizobium meliloti* Dang 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 Containers 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 soln.) 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 soln. + 3.5 g/L NaCl (=60
 mM); irrigation soln. 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 containers 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 Univ. 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

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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: _ _.