

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

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