Bermuda Grass Yield and Quality in Response to Different Salinity and N, Se, Mo and B Rates in West San Joaquin Valley

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Bermuda grass production in the saline soils of California's western San Joaquin Valley can be an effective way to manage saline drainage water. Current indications from this study suggest that this practice is sustainable.

In 2007 a container trial under different salinity and nitrogen levels was implemented at UC Davis campus to supplement field trials. 48 pots of 56.8 l were filled with soil collected at the field site in Western San Joaquin Valley. The soils corresponded to three salinity levels: 7, 14 and 22 dS m^{-1}. The pots were seeded with Bermuda grass on May 2007 and irrigated with 2 l of a synthetic saline water solution of 6 dS m^{-1} 2-3 times a week. The fertilization regime was equivalent to 0, 300 and 600 kg N ha^{-1}. The pots were harvested every 4-6 weeks at 1 cm to estimate grass growth for the different treatments. The forage samples were divided in leaves and stems and sub-samples were analyzed at the ANR laboratory on the UC Davis Campus to determine their nutritional value. We repeated the experiment in 2008 using the same containers with Bermuda grass to study the effect of boron, selenium and molybdenum on the forage yield and quality.

After two consecutive growing seasons in the containers, Bermuda grass under frequent irrigation with synthetic saline water (6 dS m^{-1}) and fertilized with the equivalent to 600 kg N $ha*y^{-1}$ yielded 20 ton DM $ha*y^{-1}$ in a soil of 7 dS m^{-1} ECe (Figure 1). With a fertilization equivalent to 300 kg N $ha*y^{-1}$ yields were close to 16 ton DM $ha*y^{-1}$. Without fertilization yields were around 1 ton DM $ha*y^{-1}$. An increment in soil salinity from 7 to 22 dS m^{-1} ECe reduced yield by 15% and 7% with and without fertilization respectively.

The leaf/stem ratio (LSR) is a traditional index of forage quality. We used the container trial to evaluate the proportion of leaves and stems in 2007 and 2008. Results were similar in both years. LSR was significantly different ($p<0.05$) between unfertilized and fertilized treatments (Figures 2 and 3). The difference between fertilized treatments (300

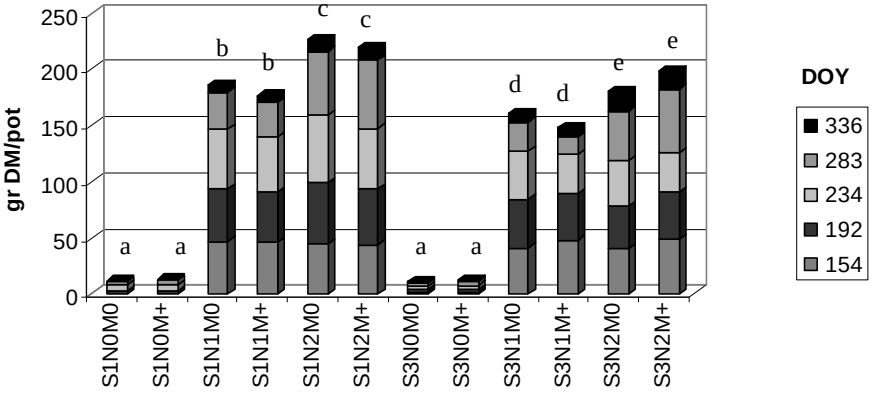

Figure 1. Bermuda grass cumulative biomass in a pot trial under different salinity and nitrogen levels in 2008. S1: 7 dS m^{-1} ECe; S3: 22 dS m^{-1} ECe; N0: 0 kg N ha^{-1}; N1: 300 kg N ha^{-1}; N2: 600 kg N ha^{-1}; M0: No trace minerals; M+: Trace minerals. DOY: Day of the year. Columns with the same letter are not significantly different ($p>0.05$).

and 600 kg N ha^{-1}) was not significant ($p>0.05$). The differences in LSR at different soil salinity levels (7, 14 and 22 dS m^{-1}) was not significant ($p>0.05$) also.

Nitrogen fertilization not only increases yield, but changes the aerial composition of Bermuda grass (Figures 4 and 5). Results of the pot trial indicate that nitrogen fertilization increases the proportion of leaves by 20% and decreases the proportion of inflorescences by the same percentage. The proportion of stems is not affected. Although the differences in the aerial composition between fertilized and unfertilized treatments were significant ($p<0.05$), they were not significant ($p>0.05$) between treatments fertilized with 300 and 600 kg N ha^{-1}. Differences in aerial composition between soil salinity levels were not significant ($p>0.05$).

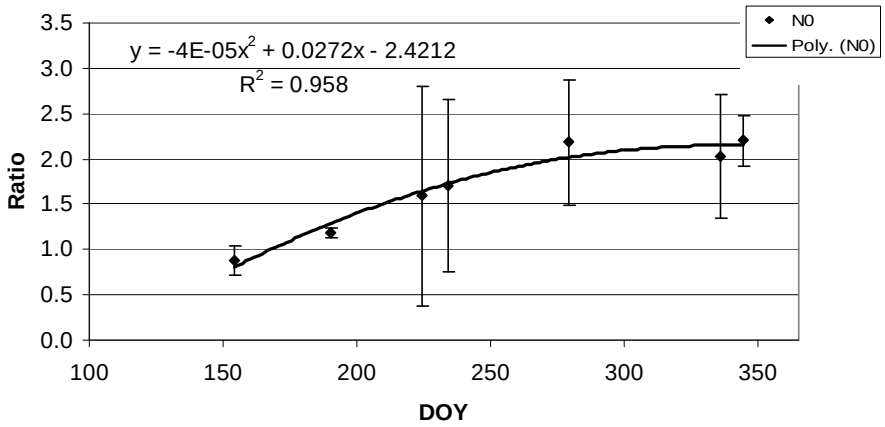

Figure 2. Leaf-stem ratio and polynomial fit of unfertilized treatments (N0) at a pot trial in 2007 and 2008. DOY: Day of the year.

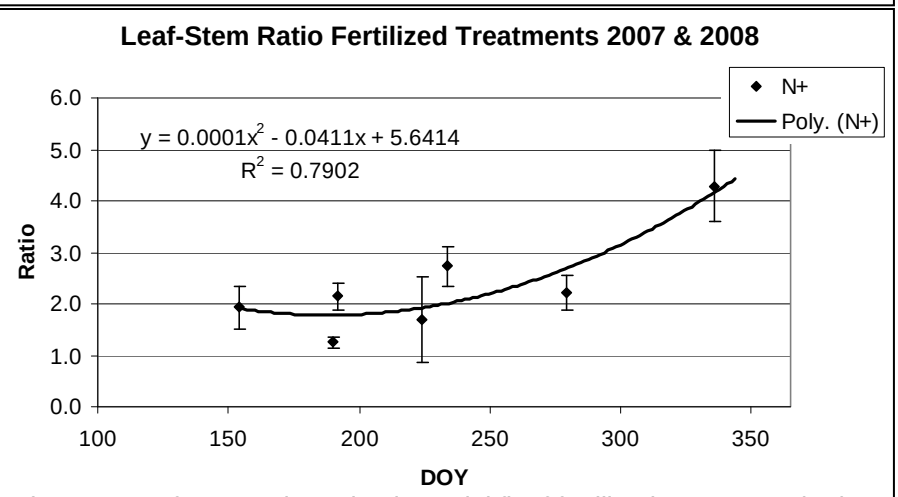

Figure 3. Leaf-stem ratio and polynomial fit of fertilized treatments (N+) at a pot trial in 2007 and 2008. DOY: Day of the year.

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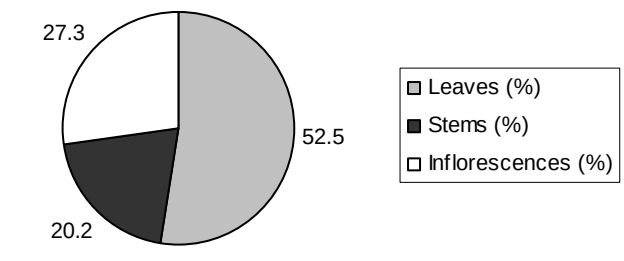

Figure 4. Aerial composition of unfertilized Bermuda grass in a pot trial (2008).

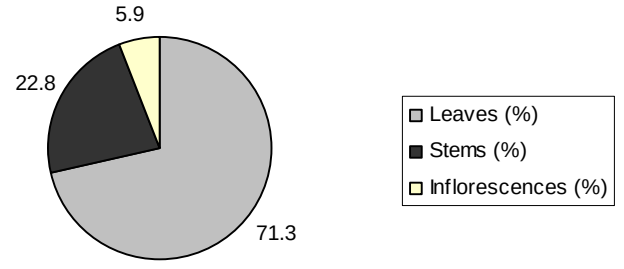

Figure 5. Aerial composition of fertilized Bermuda grass in a pot trial (2008).