

Forage Uptake of Applied Selenium

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Abstract

Selenium (Se) deficient livestock diets are problematic in Oregon and a low cost method of supplying Se was needed. Application of Se at 0.0 lb/ac, 0.5 lb/ac, 1.0 lb/ac, and 2.0 lb/ac sodium selenite and 0.5 lb/ac sodium selenate to pastures, replicated three times, was tested to determine effect of Se form and rate on forage Se uptake. Data were analyzed with Kruskal-Wallis non-parametric tests, followed by Welch t-tests. In year one, 0.5 lb/ac selenate had the highest Se uptake (2.02%; $P < 0.04$) and forage Se content (8.44 ± 0.08 ppm; $P < 0.01$) among treatments. Selenium uptake was lowest in the 2.0 lb/ac selenite treatment (0.23%) compared to control ($P = 0.01$). Selenite at 0.5 lb/ac had a Se uptake of 0.28% ($P < 0.05$) and 1.0 lb/ac selenite provided 0.52% uptake, but was not different from control ($P = 0.10$). Compared with the control (0.09 ± 0.06 ppm), the plots in the 0.5 and 2.0 lb/ac selenite treatments contained greater ($P < 0.01$) forage Se content (1.17 ± 0.05 and 4.24 ± 0.35 ppm, respectively), whereas the 1.0 lb/ac selenite treatment only tended ($P = 0.06$) to increase forage Se content (3.11 ± 0.79 ppm). Two years after Se application, only the plots treated with 0.5 lb/ac selenate and 2.0 lb/ac selenate had forage Se concentrations greater than control. These data suggest that selenite and selenate fertilization increases forage Se concentrations for up to two years and is a cost-effective method of supplying Se to grazing livestock.



Se Fertilizer Boosts Forage Se

Materials and Methods

- Se deficient pastures were identified in southwestern Oregon.
- Forage consisted of perennial ryegrass and subterranean clover.
- Treatment plots (10 x 43.5') were isolated from grazing in late winter.
- Treatments (replicated three times) were early spring Se fertilization (in Yr 1 only) as follows:
 - No added Se (control)
 - 0.5 lb/ac Se as sodium selenite (0.5 selenite)
 - 1.0 lb/ac Se as sodium selenite (1.0 selenite)
 - 2.0 lb/ac Se as sodium selenite (2.0 selenite)
 - 0.5 lb/ac Se as sodium selenate (0.5 selenate)
- Spring forage yield in Yr 1 was measured from mowed plots using a hanging scale and tarp system.
- Subsamples were collected and dry matter (DM) was determined using a forced-air oven.
- Se concentration was measured on the subsamples, after acid digestion, by fluorometric method.
- Se uptake (forage Se content as a percentage of applied Se) was calculated from above data.
- Sheep were allowed to graze fall re-growth, but were subsequently excluded from test plots.
- Yr 2 spring forage yield, DM, and Se concentration and uptake were determined as described above.
- Data were analyzed with Kruskal-Wallis non-parametric tests, followed by Welch t-tests.

Results and Discussion

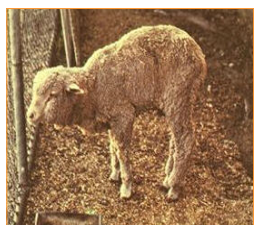
- Overall, fertilization with Se resulted in increases in Se uptake and forage Se concentrations.
- The selenate form of Se had the highest total uptake and forage Se concentrations.
- Se content of forage was in excess of animal nutrient requirements (0.1 ppm) for up to two years.
- These results are consistent with previous research in other geographical areas.
- Forage yield was not effected by Se fertilization

Introduction

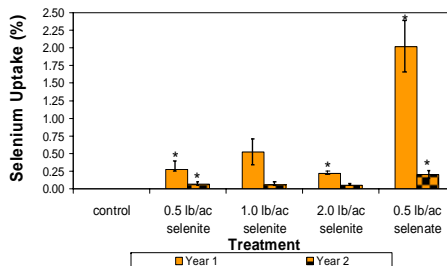
- Selenium (Se) is an essential micro mineral required by animals.
- Oregon forages have Se concentrations below that required by livestock.
- Deficiencies lead to white muscle disease and decreased animal performance.
- Excess can lead to toxicities.
- Many supplementation schemes fail to maintain blood Se levels and are costly.
- Se fertilization of pastures as a way to increase forage Se is practiced successfully in other countries.
- Different forms of Se (selenite and selenate) provide different effects.
- Acid soils in Oregon could lead to different results than previously found.
- Research was needed to study Se fertilizer to boost forage Se content in Oregon.
- Patience



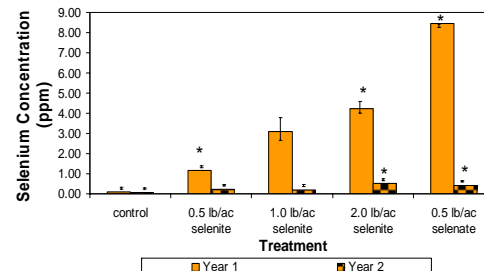
Selenium Deficiency → White Muscle Disease



Selenium Uptake in Forage



Selenium Concentration in Forage



Selenium fortified pastures improves livestock health and performance.



Implications

- Selenite and selenate fertilization increases forage Se concentrations for up to two years.
- It is a cost-effective method of supplying Se to grazing livestock.
- And it has been shown to be safe and effective.