

PROTOCOL FOR ON-FARM RESEARCH TO ESTABLISH SULFUR RESPONSE IN ALFALFA

Contact Information:

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Rationale:

A statewide alfalfa plant analysis survey in 2010 and 2011 found that over 50% of alfalfa fields sampled, which had not received manure in the previous 18 months, had less than 0.25% S in the tissue and were considered deficient in S. Most of these fields with low tissue S were considered to be normal in appearance and a nutrient deficiency was not suspected. Tissue nutrient analysis interpretation is not without its flaws. Thus, S deficiency should be confirmed by evaluating yield response to applied S.

Objective:

The objective of this project is to verify S deficiency and confirm current UWEX S fertilizer recommendations to ensure a profitable high yielding and good quality alfalfa crop.

1) Site Selection:

- a) Any alfalfa field
 - i) S response is more likely on older stands; fields without a recent history of manure application; and sandy soils. However, alfalfa yield has been increased with S application on silt loam soils in Southwestern WI.
 - ii) The entire plot area must have the same appearance at 1st cutting.
 - iii) If the field has good and bad patches and you would like to put out separate trials in both areas that is ok. However, experimental design and replication cannot be compromised.

2) Experimental Design and Plot Dimensions:

- a) 3 or 4 replications
 - i) Randomized complete block is ideal.
 - ii) However, replications do not need to be contiguous if there are patchy areas in the field. However, all treatments within a rep need to be next to each other. If the experimental design will not be a randomized complete block, consult with Carrie Laboski regarding design.
- b) Individual plots should be 10' x 20'.

3) Treatments and S Sources:

- a) Treatments
 - i) Option 1: 0 and 25 lb S/a as $(\text{NH}_4)_2\text{SO}_4$ or CaSO_4
 - ii) Option 2: 0, 25, and 50 lb S/a as $(\text{NH}_4)_2\text{SO}_4$ or CaSO_4
 - iii) Option 3: Options 1 or 2 plus 1 T/a Gypsoil or other FGD gypsum
- b) S sources and rates
 - i) $(\text{NH}_4)_2\text{SO}_4$ is 24% S and CaSO_4 is 19% S.
 - ii) For each 10' x 20' plot, 0.48 lb of $(\text{NH}_4)_2\text{SO}_4$ will supply 25 lb S/a
(1) 0.48 lb = 7.7 oz = 217 g
 - iii) For each 10' x 20' plot, 0.60 lb of CaSO_4 will supply 25 lb S/a
(1) 0.60 lb = 9.7 oz = 275 g
 - iv) If you need fertilizer or a cup that's calibrated for these fertilizer rates, contact Carrie Laboski several weeks in advance of your target application date.
Gypsoil or other FGD gypsum will not be supplied.
- c) Application timing
 - i) Apply fertilizer just after first cutting by broadcasting by hand.
 - ii) If you have never hand-applied fertilizer, you will need to practice.
 - (1) Mark off several 10' x 20' practice plots, walk down the center of the plot and spread the fertilizer like you are feeding chickens. The key is to go lightly and make sure all areas have equal coverage. If you have extra fertilizer when you get to the end, turn around and go back through the plot.

4) Soil and Plant Sampling:

a) Soil sampling

- i) Prior to applying fertilizer, collect one sample consisting of at least 10 cores to a depth of 6 to 7 inches from each replication in the experiment. (4 samples)
- ii) Analysis should include routine (P, K, OM, and pH) plus S and B

b) Plant Sampling

- i) Prior to 1st cutting collect one sample from each replication. (4 samples)
 - (1) Sample the top 6" of 30 plants that are at the bud to 1st flower growth stage and composite into one sample.
 - (a) Samples should be taken from different crowns.
 - (b) Plant analysis should include total minerals plus total N
 - (c) Be sure to submit these samples together with the soil samples to get the best price at the lab.

5) Optional Plant and Hay Sampling:

- a) Contact Carrie Laboski if you plan to do this because of the extra costs associated with the analysis.

b) Optional Plant Sampling

- i) Prior to 2nd cutting (this is the 1st harvest after fertilizer application) collect one sample from every plot
- ii) Sample the top 6" of 20 plants that are at the bud to 1st flower growth stage and composite into one sample.
 - (1) Samples should be taken from different crowns.
 - (2) Analysis should include total minerals plus total N

c) Optional Hay sampling

- i) At 2nd cutting, collect several handfuls of cut hay (not more than would fit in a paper lunch bag)
 - (1) Samples should be taken from every plot
 - (2) Analysis should include total minerals plus total N

6) Sample Handling and Laboratory:

- a) If mailing samples to the lab, be sure to dry plant and hay samples over a heat vent or in the sun for 1 to 2 days before placing in a large paper envelope. Do not pack samples into envelope.
 - i) Air-drying is not necessary if samples are delivered to the lab in person within 24 hours of sampling.
- b) Laboratory
 - i) Send **all** samples to the UW Soil & Forage Analysis Lab in Marshfield. John Peters will ensure appropriate analyses are conducted.
 - ii) Use the Team Forage account number for this project.

7) Harvest

- a) Prior to grower harvesting the entire field, harvest a 5'x15' strip from the center of the plot.
 - i) Use a weed eater, plot harvester, or other innovative means
 - ii) Weigh entire swath of cut hay (plot fresh weight)
 - iii) Weigh a subsample of fresh cut hay (subsample fresh weight)
 - iv) Dry subsample and reweigh (subsample dry weight)
 - v) Be sure to measure the exact width and length of the swath for each plot
- b) Collect yield from each plot for cuttings 2 through 5 (or as many cuttings as the grower has)

8) Data Collection:

- a) Complete the data collection Excel file (2012_Alfalfa_S_Trial_Data_Form.xls). This file provides a template for all of the site information along with site and yield data that is needed. The Excel file can be found at:
<http://www.soils.wisc.edu/extension/onfarmdemo/>
 - i) Fill out all information as completely as possible. Crop and site history information is helpful when interpreting the results.
 - ii) Please fill in all soil, plant, hay analysis information.

- iii) Be sure to fill out all tabs in the Excel file and be sure to scroll down to ensure that you don't miss any information.
- b) The data collection file should be named in the following manner: county-your name- year-Alfalfa_S_Trial.xls
Example: Dane-Laboski-2012-Alfalfa_S_Trial.xls
- c) Email the completed data collection file to Carrie Laboski and Todd Andraski (andraski@wisc.edu) by **October 15**.

If you have any questions, please call Carrie Laboski to discuss.

Example Plot Diagrams

Numbers within the diagram are S rates in lb S/a.

	Option 1		Option 2			Option 3			
rep 1	0	25	0	50	25	0	25	FGD	50
rep 2	25	0	50	25	0	25	0	50	FGD
rep 3	25	0	25	0	50	50	FGD	25	0
rep 4	0	25	25	50	0	25	FGD	0	50