Sulfur Fertilization in Louisiana Sugarcane Production Systems

M. Dalen[1], B. Nicchio[1,2,3], D. Forestieri[1], M. Martins[1] and B. S. Tubaña[1]

[1]Louisiana State University AgCenter, School of Plant, Environmental, and Soil Sciences, Baton Rouge, LA, USA
[2]Federal University of Uberlandia, Agrarian Science Institute, Uberlandia, MG, Brazil
[3]CAPES Foundation – Process nº 88881.135080/2016-01, Brasilia, DF, Brazil

INTRODUCTION

Sulfur (S) plays an important role in plant metabolism. It is required in photosynthesis and production of amino acids and proteins. The atmospheric S deposition has declined since the implementation of Clean Air Act in 1985 which partially contributes to increasing number of cases of S deficiencies in crop production in the US. Sugarcane (*Saccharum officinarum*) exhibits luxury consumption and removes a considerable quantity of S from the soil. So the manageable rates and in combination with other granular fertilizer can facilitate the adoption of this rather new agronomic practice in sugarcane production.

OBJECTIVE

Evaluate the effect of S fertilization using different sources in replicated field experiment on Louisiana sugarcane production system.

MATERIALS AND METHODS

Location: Sugar Research Station, Saint Gabriel and Donaldsonville, Louisiana

◆ **Saint Gabriel Site:**

- ***Site 1***: Established on a Commerce silt loam soil (Plant Cane)
  - Variety: L01-299
  - Plot size: 40 ft x 3 rows
  - Experimental Design: RCBD with four replications
- ***Site 2:*** Established on a Sharkey clay soil (1st Ratoon)
  - Variety: L01-299
  - Plot size: 40 ft x 3 rows
  - Experimental Design: RCBD with six replications
- ***Site 3:*** Established on a Commerce silt loam soil (1st Ratoon)
  - Variety: L01-299
  - Plot size: 50 ft x 3 rows
  - Experimental Design: RCBD with three replications

Treatment Structure:

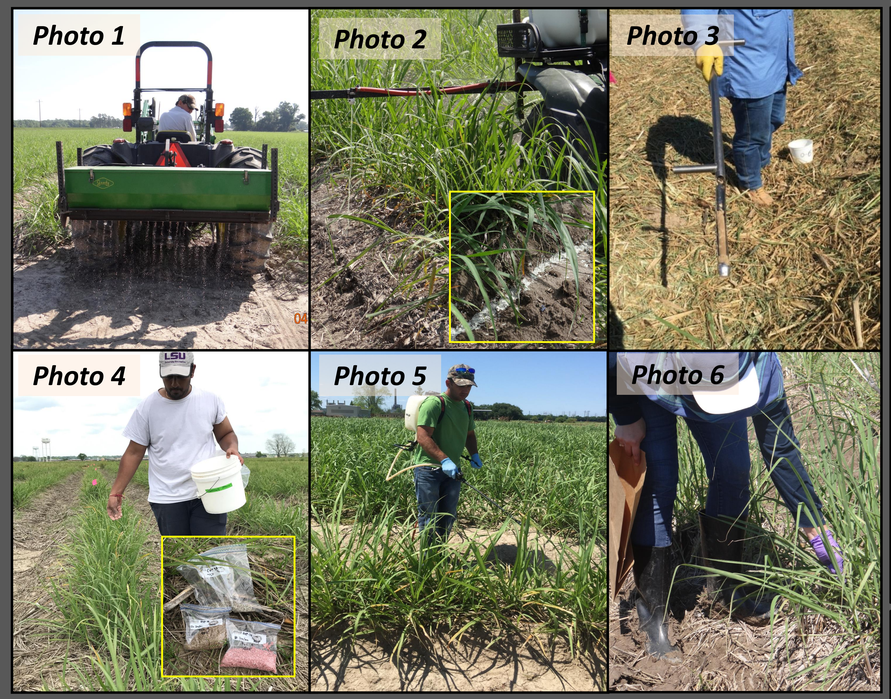
Table 1. Application of different sulfur fertilizer sources at Saint Gabriel.

Treatment	Description
1	Check (No S, No K)†
2	Check (No S)
3	Phosphate MST (8-44-0-22S)†
4	Microessentials (13-33-0-15S)†
5	Potash MST (0-0-52-13S)†
6	Potash + Ammonium Sulfate†
7	Liquid MST (8-0-0-45S)[1]†
8	Ammonium Thiosulfate (12-0-0-26S)[2]

[1]density 13.3 kg L^{-1}; [2]density 10.9 kg L^{-1}. †Donaldsonville treatments.

◆ **Donaldsonville Site:** The experiment was established on a silty loam soil with a plot size of 550 ft x 3 rows. There were six treatments (Table 1 †) arranged in a randomized complete block design with two replications.

◆ **Fertilization:** The granular and liquid S containing fertilizer were applied using the Gandy applicator (Photo 1) and a four-wheeler mounted with fertilizer applicator (Photo 2), respectively for the producer's field at Donalsonville, LA. On the other hand, for Saint Gabriel site, granular S was applied by hand (Photo 4) and liquid S was applied using backpack sprayer (Photo 5).



Soil Sampling: Initial soil sampling was done for both sites (Photo 3). One month after S fertilization, soil sampling was collected only for the Donaldsonville site. Twenty-four core samples from inner rows for each plot (0-15 cm depth) were collected and analyzed through Inductively coupled plasma spectrometry (ICP) for S content using Mehlich-3 extraction procedure.

Leaf Sampling: Randomly-selected, 18 leaves from the middle row (Photo 6) were collected one month after fertilization and analyzed for S content for both Donaldsonville and Saint Gabriel sites. The leaves samples were digested using nitric acid – hydrogen peroxide Method. Plant digest was analyzed using ICP.

RESULTS AND HIGHLIGHTS

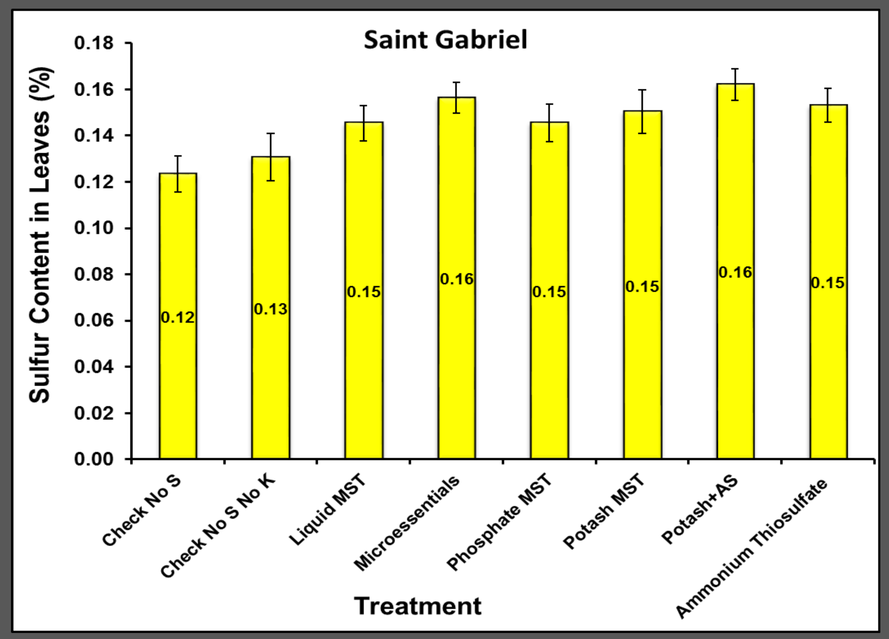
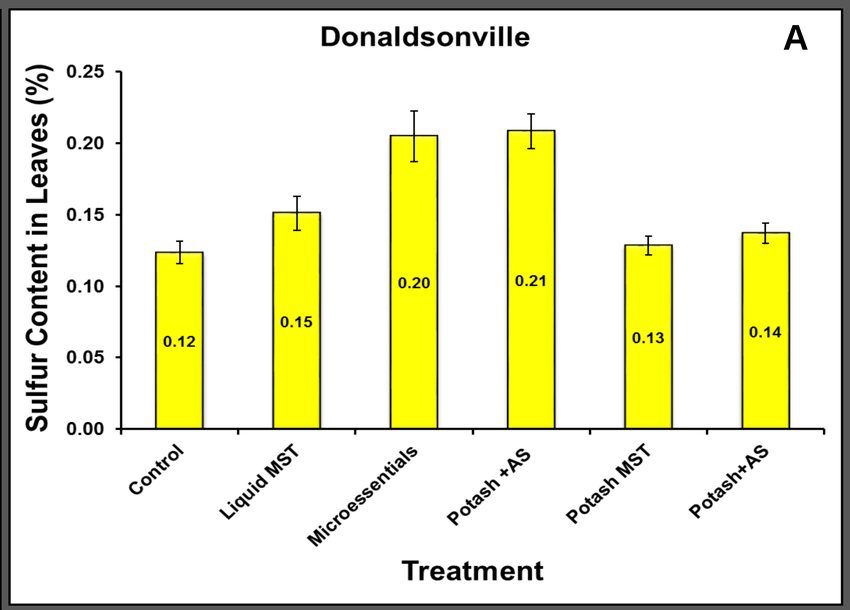


Figure 1. Sulfur content in leaves one month after S fertilization, Saint Gabriel, LA.



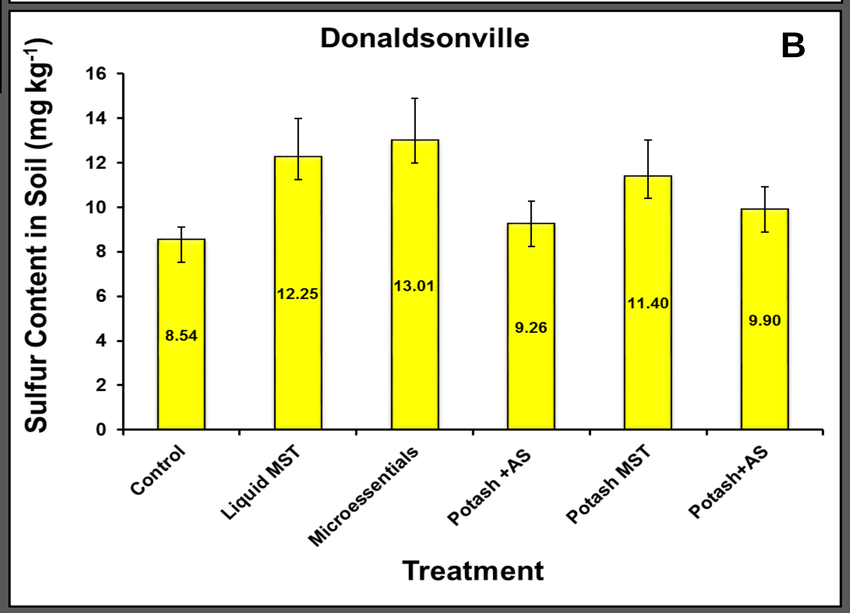


Figure 2. Sulfur content in leaves (A) and soil (B) one month after S fertilization, Donaldsonville, LA.

- ❑ The application of S increased leaf S content by 0.03% (30 g kg^{-1} leaf dry weight) across the four sites (Figures 1 and 2A).
- ❑ In Donaldsonville, the highest leaf S content of 0.21% (Figure 2A) was obtained from plots treated with a source containing both elemental S and sulfate form (Microessentials®).
- ❑ The S content of soil based on Mehlich-3 procedure was higher in plots which received S fertilizers (11 mg kg^{-1}) than in the control plot (8 mg kg^{-1}) with Microessentials and liquid MST-treated plots (13 mg kg^{-1}) having the highest soil S (Figure 2B).
- ❑ Our initial results showed that S sources containing sulfate and MST were effective in raising leaf and soil S. A season-long availability of S is important for crops especially for sugarcane which has a long growing season in Louisiana.

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