

IMPACTS OF PAPER MILL PRIMARY CLARIFIER SLUDGE ON SUGAR CANE PRODUCTION AND YIELDS

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Most Louisiana agricultural soils are low in organic matter content. Increasing organic matter content will increase water and nutrient-holding capacity, improve water percolation through the soil, improve tilth, and reduce erosion. These factors can cause improved plant survival and growth. The result can be increased yields with lowered fertilizer requirements and less soil, pesticide and nutrient loss in runoff.

Paper mills collect large volumes of short fiber (sludge) from the paper-making process in their waste water treatment plants. This material is primarily composed of partially digested cellulose and hemi-cellulose fibers and algae bodies with some residual lime. It is a convenient material to use and apply. The paper industry is seeking ways to use this material rather than landfill the large volumes they produce. It appears to be a good candidate as an amendment to increase soil organic matter contents in the production of sugar cane.

A study was initiated at the St. Gabriel Research Station in the fall of 2000 using paper mill sludge applied in the open furrow, planting the seed cane, and closing the furrow. The sludge was applied at 0, 10, and 20 tons per acre using a Ty-Crop® Spreader. Fall fertilizer was applied at 0 and the recommended rate of 15-45-45 after planting to each sludge application rate creating the first of the two split-plot levels. The second split occurred with the spring fertilizer applications where each of the six previous treatments was subdivided into three plots for the application of 0, 80, and 160 pounds per acre of N in the form of ammonium nitrate. Each of the 18 treatments was replicated four times. Normal agronomic and pest control practices were followed.

The plots were harvested with a sugarcane combine harvester on December 3, 2001. Plots weights were recorded using a 3.5-ton weigh wagon, which had load cells to record the weights. A 10-stalk sample was taken for sucrose analysis. Tons of cane per acre were estimated from plot weights, and pounds of recoverable sucrose per ton of cane were estimated from Brix and pol readings. Sugar per acre was calculated as the product of cane yield and recoverable sucrose per ton of cane. The data were analyzed with the PROC MIXED procedure of SAS (v. 8.2).

There were no significant differences between treatments or combination of treatments for tons of cane per acre, sugar per ton, or sugar per acre. Average yields of cane ranged from 43.2 to 44.1 tons per acre. Sugar per ton averages ranged from 190 to 197 pounds per ton. Sugar per acre ranged from 8,210 to 8,684 pounds per acre.

Since there were no decreases in yield from the un-stabilized organic amendment the responses are considered to be positive and the study will be continued. Research with compost applications on other crops normally does not show significant yield increases until the second year.

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Table 1. Mixed model analysis of fixed effect terms for the Paper Mill Sludge test conducted at the St. Gabriel Research Station during 2001.

| Source | Num df | Den df | Sugar per acre | Tons per acre | Sugar per ton |
|--------|--------|--------|----------------|---------------|---------------|
| | | | | | Pr > F |
| Sludge | 2 | 9 | 0.28 | 0.68 | 0.32 |

| | | | | | |
|----------------|---|----|------|------|------|
| Starter | 1 | 45 | 0.32 | 0.83 | 0.11 |
| Spring | 2 | 45 | 0.54 | 0.45 | 0.12 |
| Sludge*Starter | 2 | 45 | 0.47 | 0.09 | 0.03 |

| | | | | | |
|-----------------------|---|----|------|------|------|
| Sludge*Spring | 4 | 45 | 0.24 | 0.47 | 0.37 |
| Starter*Spring | 2 | 45 | 0.63 | 0.98 | 0.57 |
| Sludge*Starter*Spring | 4 | 45 | 0.20 | 0.20 | 0.01 |

Table 2. Treatment means for the paper mill sludge experiment conducted at the St.Gabriel Research Station during 2001.

| Sludge Tons/ac | Sugar per acre lbs/ac | Tons per acre Tons/ac | Sugar per ton lbs/ton |
|-----------------------|--------------------------|--------------------------|--------------------------|
| 0 | 8684 | 44.0 | 197 |
| 10 | 8210 | 43.2 | 190 |
| 20 | 8457 | 44.1 | 192 |
| Significance (P=0.05) | NS | NS | NS |

| Starter Fertilizer | Sugar per acre lbs/ac | Tons per acre Tons/ac | Sugar per ton lbs/ton |
|-----------------------|--------------------------|--------------------------|--------------------------|
| 0-0-0 | 8380 | 43.9 | 191 |
| 15-45-45 | 8521 | 43.7 | 195 |
| Significance (P=0.05) | NS | NS | NS |

| Nitrogen Rate | Sugar per acre lbs/ac | Tons per acre Tons/ac | Sugar per ton lbs/ton |
|-----------------------|--------------------------|--------------------------|--------------------------|
| 0-0-0 | 8549 | 44.1 | 194 |
| 80-0-0 | 8358 | 44.1 | 190 |
| 160-0-0 | 8445 | 43.2 | 196 |
| Significance (P=0.05) | NS | NS | NS |