

Agronomic Technical Bulletin

SULPHUR AND SUGARCANE PRODUCTION

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Sugarcane is a perennial tropical grass crop. Florida and Louisiana produce greater than 90% of total sugarcane production in the United States. Texas and Hawaii account for the remaining production. Brazil is the world's largest producer, representing approximately one-third of world production. India is the world's second largest and China is the fourth largest producer. Combine India, China, and Thailand production to compose approximately one-third of world production of sugarcane (Geisler, 2012). The United States Department of Agriculture estimates reveal that sugarcane represents about 80% of total sweetener production.

High demand for sugar by consumers and higher expectations combined with intensive production management practices employed by farmers, places immense pressure on the soil for plant available nutrients. "Most, if not all soils require some level of fertilizer or amendment input to produce high crop yields" (Rice et al., 2010). Efficient sugarcane production must be based on fundamental soil sample analyses. "Applying the proper amount of nutrients saves the producer money, helps protect the environment, maximizes crop yields, conserves valuable resources, and prevents nutrient imbalances. More specifically, a well-managed fertilizer program promotes rapid canopy development, increases crop resistance to diseases and insects, and lowers irrigation requirements. Rapid canopy development, in-turn, aids in weed control" (Rice et al., 2010).

The remainder of this bulletin will be more meaningful with some understanding of sugarcane physiology terms. As mentioned earlier sugarcane is a perennial plant. Following harvest it will enter a dormant stage prior to resuming vegetative regrowth from its root structures. Plant crop is the first year that the sugarcane crop was established with stem segments. 1st ratoon is the 2nd year of the crop which regrows from root structure. The 3rd and 4th ratoons are subsequent years of regrowth.

MANAGEMENT CONSIDERATIONS

Optimizing sugarcane yield and maximizing sugar content of the cane requires comprehension of the significance of the crop demand and plant nutrient supply. Utilization of reliable soil sample analyses provides the most favorable return on investment of plant nutrients. "Four points must be considered during the evaluation of a soil analysis report to reap greatest crop yield possible: 1) What nutrients are needed? 2) How much of each nutrient is needed? 3) What source of fertilizer should be used? 4) How and when should they be applied?" (Gravois et al., 2013). Those four points match the 4Rs best management practices; right source, right rate, right time, right place. A nutrient management plan provides the foundation to implement the 4Rs best management practices to obtain most effective plant nutrient utilization. Several management tools must be evaluated to formulate a well-designed nutrient management plan. Soil sample analyses can be a good foundation to build upon. Plant tissue analyses utilized with visual observation of plant nutrient deficiency symptoms can provide significant information. Field history from previous crops can supplement collected data to enhance management decisions.

PLANT NUTRIENT DEMANDS

Plant nutrient requirements for sugarcane are same in all production areas. The soil conditions and nutrient supplying ability influence the source, rate, and time of applications. In Florida "approximately 80% of sugarcane is grown on organic "muck soils (histosols)" of the Everglades Agricultural Area. These soils are very productive with high water holding capacity and nutrient holding capacity (Morgan et al., 2012).

Sulphur (S) is an essential plant nutrient. When a deficiency occurs the plant exhibits unique foliar and growth characteristics. Figure 1.0.



Figure 1.0
Sulphur deficient sugarcane leaf (right) healthy leaf on left.
Photo: A. Hurney

SUPPORTING RESEARCH

Becoming familiar with each nutrient's deficiency symptoms can contribute to more informed management of plant nutrient status. Sulphur deficiency is characterized by general yellowing of younger leaves. Those leaves tend to be shorter, narrow, and stems are spindly. The organic soils in Florida release sufficient amounts of S for sugarcane growth. Therefore, University of Florida does not provide specific S recommendations for crop nutrition. The organic soils are alkaline and S recommendations provide acidifying characteristics that reduce soil pH. Reducing soil pH into the optimum range of 6.0 – 6.5 results in greater availability of other nutrients, especially the micronutrients (Morgan et al., 2012). "When soil pH exceeds 6.6, the suggestion has been to apply (in furrow) 500 lbs. S/A for muck and sandy mucks, 300 lbs. S/A for mucky sands, and no S for sands" (Rice et al., 2010).

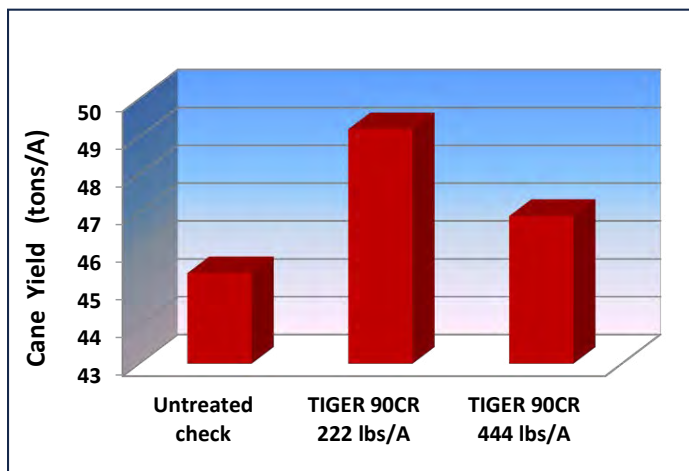


Figure 2.0

Sugarcane response to sulphur applications on organic soils in Florida.

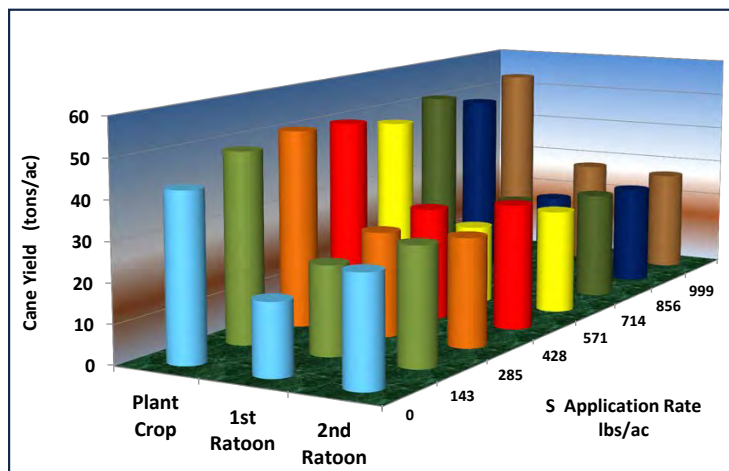


Figure 3.0

Sugarcane yield as influenced by increasing S applications. (adapted from Wiedenfeld, 2011)

TIGER-SUL research in Florida has demonstrated positive crop response to sulphur applications. Fig. 2.0.

In Louisiana sugarcane yield responses to added S have been reported. "Yield response due to S fertilizer may be expected: 1) stubble cane is more likely to respond to S fertilizer than plant cane and 2) sugarcane grown on fine-textured soils (clays) is more likely to respond to S fertilization than sugarcane grown on coarse-textured soils (sandy loam and silt loams)" (Gravois et al., 2013). LSU's general recommendation for S is 24 lbs./A with low S soil test values. This recommendation can be fulfilled with TIGER 90CR at 27 lbs./A or TIGER XP at 28 lbs./A.

A research report from Texas A&M University revealed increasing yield response with increased elemental S application rates in the plant cane crop. The yield decreased in the 1st and 2nd ratoon crops. Researcher indicated that possible increase in salinity content due to higher sulphur applications may have contributed to the reduced yield in 1st and 2nd ratoon crops (Figure 3.0).

Micronutrient applications in Florida tend to focus on manganese (Mn); whereas, in Louisiana if a micronutrient is required, it tends to be zinc (Zn). General guidelines for Mn on high pH (> 6.5) organic soils and sandy soils in Florida:

- 1) Place S & Mn in furrow at planting
- 2) 5 lbs Mn/A on mucks and sandy muck soils
 - a. 35 lbs./A of TIGER Micronutrients® Mn 15% or
 - b. 100 lbs./A of TIGER Micronutrients® Manga-Sul
- 3) 2.5 lbs Mn/A on mucky sands and sandy soil types (Rice et al., 2010)
 - a. 17 lbs./A of TIGER Micronutrients Mn 15% or
 - b. 50 lbs./A of TIGER Micronutrients Manga-Sul

Manganese deficiency is shown in fig. 4.0.



Figure 4.0

Manganese deficiency appears on younger leaves with interveinal chlorosis from leaf tip toward the middle of the leaf.

Photo: J Reghenzani

In an effort to confirm product performance TIGER-SUL established sulphur and manganese trials in Florida. Figure 5.0 reflects positive crop response to both nutrients.

In Louisiana Zn deficiency tends to be more prevalent and Zn applications are recommended when soil test results or plant tissue analysis reveal a potential deficiency. If soil test values are < 1.0 ppm, Zn application rate should be 6 lbs./A or 35 lbs./A of TIGER Micronutrients Zn 18%. When soil test values are < 2.25 ppm apply 3 lbs. Zn/A or 17 lbs./A of TIGER Micronutrients Zn 18%. Zinc deficiency is described with photo in figure 6.0.

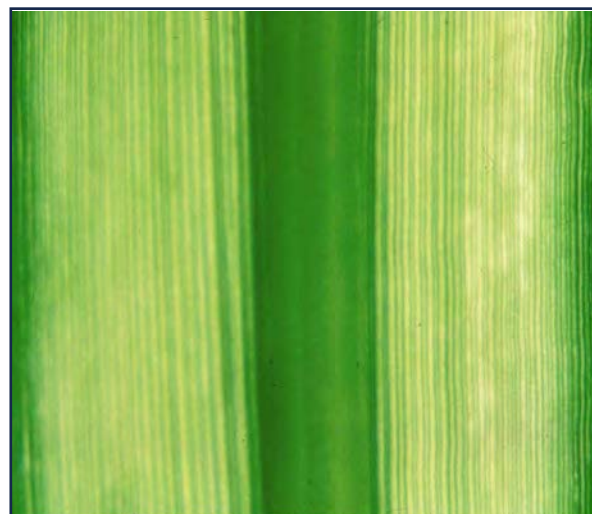
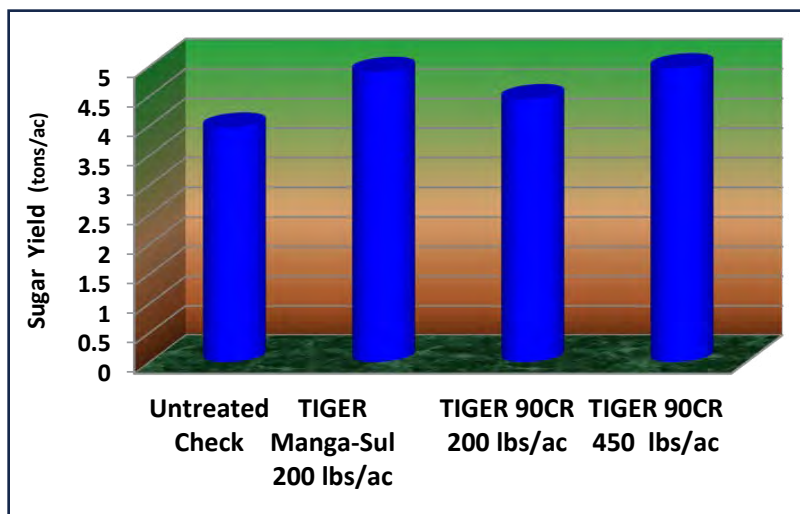


Figure 5.0

Sugarcane responses to combined sulphur and manganese applications.

Figure 6.0

Zn deficiency appears in younger leaves. A broad band of yellowing in the leaf occurs. The midrib and leaf margins remain green.

Photo: J Orlando Filho

Employment of a well-planned nutrient management program implemented with all available decision aid tools contributes to optimized crop yields. Incorporating the 4R best management practices into decision-making process provides foundation for responsible agriculture. Sugarcane has high requirements for all plant nutrients. Sulphur is one of the secondary nutrients that require attention so that it does not become a yield limiting factor. TIGER-SUL Products can provide the necessary sulphur and micronutrients for maximum sugarcane production.

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