Sugarcane Genotype Responses to Mill Mud Application

Sugarcane is an important industrial crop in Florida. Approximately 80% of sugarcane in Florida grows on organic (muck) soils and 20% on mineral (sand) soils. Growers are seeking to expand sugarcane production on sand soils because of saturation of using muck soils and loss of muck soil depth. However, sugarcane yields are much lower on sand soils than on muck soils, which is caused largely by the low organic matter content and poor nutrient and water-holding capacity of these soils. Thus, there is poor soil fertility coupled with challenges in providing proper nutrient supplements at the proper time and the potential for water-deficit stress during the growing season. These problems may be further exacerbated by freezing temperatures, diseases, and insects.

A partial approach for addressing these problems may be to focus more intensely on the selection of sugarcane cultivars well adapted to sand soils. Presumably, these cultivars would yield well by using nutrients and water more efficiently. A major reason that more intense cultivar selection for sand soils may help contribute to a solution is that historically in Florida, more emphasis has been placed on identifying high-yielding sugarcane cultivars for muck than for sand soils.

Mill mud is a by-product of the sugarcane milling process. It is composed mostly of residue from sugarcane and muck soils along with some lime used in milling. Adding mill mud to a sand soil increases yields substantially, but this is not a solution for improving commercial yields on sand soils because there is not enough mill mud available and it is costly to transport.

In the March–April 2015 issue of *Agronomy Journal*, researchers hypothesized that a muck soil and a sand soil with large quantities of added mill mud would be similar soil environments for sugarcane. Therefore, they carefully selected eight genotypes and tested them on a sand soil in plots with and without added mill mud. This allowed the researchers to learn about the differences in physiological, growth, and yield responses on muck and sand soils for genotypes adapted to both soil types, genotypes well adapted to muck soils, and genotypes well adapted to sand soils.

The field study used one Erianthus (*Erianthus arundinaceus*) and seven sugarcane genotypes. Erianthus is a large grass with tall and thick stalks. It has vigorous growth, drought and waterlogging tolerance, good ratooning ability, and disease resistance. Mill mud was applied to designated plots at the rate of 250 t ha⁻¹. All measurements were taken in the first- and second-ratoon crops.

Mill mud application reduced leaf reflectance at wavelengths of 560 and 710 nm and significantly increased leaf chlorophyll level, stomatal conductance, leaf net photosynthetic rate, and transpiration rate in the first-ratoon crop only. Genotypic differences were detected in most physiological parameters and yield components. Most physiological traits correlated with cane and sucrose yields when no mill mud was added. The genotype variation in physiological and yield responses to mill mud application, the genotype × mill mud interactions in yields, and correlations of yields and physiological parameters for sand soil without adding mill mud indicated that selection of sugarcane genotypes well adapted to sand soils can be improved by using physiological measurements such as leaf photosynthesis, the difference between leaf/canopy and air temperatures, leaf chlorophyll levels, stomatal conductance, and spectral reflectance as selection criteria.


Bird's eye view of the part of the experimental main plots of sugarcane with (top) without (bottom) added mill mud on a sand soil at Clewiston, FL.

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