REGULATION OF SUCROSE ACCUMULATION IN FIELD GROWN SUGARCANE

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Sugarcane is an important model for studies of source-sink relations due to its ability to store high concentrations of sucrose in the culms. The use of recombinant DNA technology tools as a strategy to raise the concentration of sucrose content in sugarcane requires a broad knowledge related to metabolism and regulation associated with sucrose accumulation. The main objective of this study is to understand the behaviour of physiological processes, such as photosynthesis and yield, in high brix genotypes. To this end, two different populations of the RIDESA breeding program grown in the field were analyzed: *(i)* 3 sets of F1 progeny grown since 2005 (stage T1) as a result of crosses between contrasting parents in relation to soluble solids content (Crossing II: SP70-1143 x RB925211 and Crossing IV: RB855002 x RB855035) and *(ii)* a T3 progeny derived from two cycles of selection, which aimed to increase the concentration of favorable alleles for brix enrichment. The parameters measured were: brix content, diameter of internode 3 to the last base of stem, plant height, culm length, leaf area and photosynthesis rate. All measurements were done from seven months old field grown sugarcane plants. Among the data collected, there seems to be a slight trend in the assimilation of CO_2 in relation to brix value (higher brix correlates to a lower rate of carbon dioxide assimilation). However, there are cases where genotypes considered as high brix exhibited greater rates of assimilation and vice versa. This is an interesting finding that might indicate a path towards adding more sucrose on sugarcane by increasing the photosynthetic rate. The correlation between yield and brix also seems to reveal a slight trend in which higher brix is related to greater productivity for some genotypes. Thus, our data seems to indicate that some genotypes seem to have achieved a desensitization of source-sink relationships, where higher brix genotypes showed a higher rate of CO_2 assimilation than those reported for genotypes with lower brix. Previous studies suggest that stored sucrose prevents increases in the rate of CO_2 assimilation in genotypes of high sucrose, through a negative feedback not fully explained yet. The genotypes were also expression profiled using oligoarrays. The regulatory pathways leading to activation or deactivation of photosynthesis and sucrose accumulation will in be used in the generation of transgenic plants and in search for molecular markers useful for the selection processes.

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