

Gene expression profiling of sugarcane varieties contrasting for sucrose content

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Sugarcane is the primary source of sugar and ethanol in Brazil. Studies regarding sucrose and biomass accumulation aiming to understand these processes are an important step to produce new cultivars with higher yield. With this purpose, we analyzed four field-grown varieties contrasting for brix content (soluble solids, which in sugarcane is composed mainly by sucrose), two of them high brix and two low brix. cDNA microarray results of immature internodes were analyzed for altered expression of genes involved in cell wall and carbon metabolism. qPCR was used to further investigate the transcriptome alterations associated to brix differences. We observed a positive correlation between the expression profile of some of these genes and sucrose content. Among them, we can point out a sucrose phosphate synthase (SPS), an enzyme responsible for sucrose synthesis which was up-regulated in immature and mature internodes of high brix plants. We also identified altered expression of two sucrose synthase genes (SS). SS catalyses the inverse reaction of SPS and was found up-regulated in immature internodes of high brix plants. We also identified cell wall-related genes up-regulated including two expansins and a cellulose synthase with higher expression in immature internodes of high brix plants. These results may suggest that sucrose accumulation is dependent in cell expansion and growth. Besides, the higher mRNA levels of SPS in immature and mature internodes of high brix plants, even being much lower than SS, ranging from 60 to 300 fold lower, seems to be crucial for sucrose accumulation. All these results taken together may aid to understand the carbon partitioning regulation in sugarcane.

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