Transcription factors, dirigent proteins and lignin in sugar cane

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The lignin is a bottle-neck for ethanol cellulosic production. In sugarcane little is known about lignin metabolism. The lignin biosynthesis pathway genes were well characterized in plants models species but transcription factors (TFs) and genes related to monolignols polymerization remain elusive. There is a hypothesis that dirigent proteins (DIRs) act during lignin polymerization, however there is an enormous gap in the literature concerning their function. In sugarcane, the transcriptional and promoter characterization analysis from a Dirigent-family (*ScDIR1*) showed its mature stem specific transcriptional-regulation, and its association to the sucrose accumulation. In order to study the relationship among the TFs and DIRs genes expression and lignin content in sugarcane, the spatial transcriptional analysis was performed by qPCR with two sugarcane varieties contrasting in stem lignin content, IACSP04-529 (higher) and IACSP04-683 (lower), for immature stem (apical meristem and internodes 1–3), intermediary maturing stem (internodes 5–7) and mature stem (internodes 15–17). It was selected for gene expression analysis seven TFs described in other plants as related to lignin and secondary cell wall regulation, and nine DIRs from three distinct phylogenetic classes. The TFs *ScVND7*, *ScNST1*, *ScMYB46* and *ScMYB83* had higher expression in immature than in mature stems. Other three TFs (*ScMYB58*, *ScKNAT7* e *ScMYB52*) showed higher transcriptional levels in intermediary maturing stem. Most of the TFs was more expressed in the IACSP04-529 genotype than IACSP04-683, suggesting their correlation with the lignin content. Most of the DIRs was more expressed in immature stems. Only Sc*DIR1* family and SCMCSD1062A02 exhibit higher expression in mature than immature stems. Each one of the nine DIRs evaluated showed a specific expression profile. In addition, others TFs are being evaluated and the tissue-specific localization of *ScDIR1* is being defined by *in situ* hybridization studies.

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