

CONTROL OF LIGNIN BIOSYNTHESIS IN SUGARCANE: MANY GAPS STILL TO BE FILLED

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Lignin content may vary in response to several biotic and abiotic stresses and understanding how this occurs may help to understand how to control the lignin biosynthesis and consequently its content in plants. Very little is known about lignin metabolism in sugarcane. However, taking in account the information accumulated for other plants and the agronomical practices and problems in sugarcane cultivation, we may have enough hints to plan several studies on how sugarcane modulates lignin composition and content. Therefore, the aim of this project is 1) to cultivate contrasting sugarcane genetic material for lignin content in six locations well characterized for temperature, water availability and irradiance and analyze lignin, sucrose and cellulose, and then, based on these results to study gene expression and perform a more detailed study of lignin composition; 2) to search the SUCEST database for ESTs coding transcription factors known to be involved in lignin metabolism in model plants and use this information in controlled studies (on water supply, nitrogen fertilization, light intensity and low temperatures under field and greenhouse conditions, and growth chamber) to establish correlations between transcription factors regulation and lignin content and composition; 3) search the SUCEST database for ESTs coding orthologs to peroxidases and laccases and use this information in the controlled studies to evaluate the involvement of these enzymes in lignin biosynthesis; 4) to perform a system biology study of regulatory network involved in lignin biosynthesis. To reach these aims we will use a population segregating for lignin content. With this information we may get some valuable knowledge on the lignin biosynthesis in the complex sugarcane genome. Shortly we believe to have at least initial information on how environmental factors affect

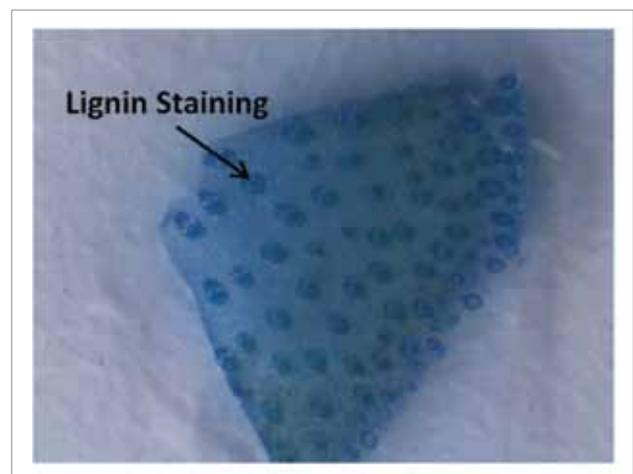


Figure 1. Lignin Staining

different sugarcane genotypes. Also it is expected that our results allow us to understand how genes of the lignin biosynthesis pathway and related transcription factors changes lignin content and structure in sugarcane as influenced by some specific environmental factors. In a long-term objective, we may have the possibility to gain knowledge on the agronomical practices may contribute to decrease lignin in sugarcane. This knowledge on the interaction of environmental factors and control of the lignin biosynthesis and related transcription factors may allows us to design a transgenic plants altered in specific genes, aiming not only the decrease of lignin but also its structure.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

- 1) selected the sugarcane material to be planted in the six experimental fields;
- 2) installed greenhouse experiments for controlled studies (on water supply and nitrogen fertilization);
- 3) started the analysis of the SUCEST database crossing sequence and functional information with the rice, sorghum and Arabidopsis genomes in order to select sequences for lignin biosynthesis including for peroxidase and laccase and transcription factors;
- 4) started to map the lignin distribution in the sugarcane plant in order to understand the temporal deposition and distribution in the cane.

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