

SUSTAINABLE BIOENERGY SUGARCANE BREEDING AND CULTIVARS DEVELOPMENT

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Figure 1. A. Sugarcane germplasm collection (Sugarcane Cross Station, Uruçuca, BA). B. Photoperiod Facility. C. Sugarcane wild accessions. D. Sugarcane transition genotypes for biomass

This Project proposed a reorientation of the current selection processes in the sugarcane genetic breeding focused on the development of cultivars designed to fill the new bioenergetic demand by acting on four main research topics. In the first topic, clones fitting the definition of primary energy production potential already at the advanced stages of the IAC Sugarcane breeding Program Experimental Network were characterized and selected. In the second topic, applying the combined selection process at the early stages of the breeding process, the most efficient parents in generating progenies with high potential for bioenergy was

identified and selected. In the third topic, a genetic introgression program involving crosses between commercial cultivars and *Saccharum spontaneum* accessions was initiated to promote the incorporation of new genes for sucrose accumulation and biomass production. Finally, in the last topic, the genetic diversity for the major sugarcane pathogens (*Puccinia melanocephala* – brown rust; *Ceratocystis paradoxa* – pineapple rot; *Xanthomonas albilineans* – leaf scald, *Ustilago scitaminea* – sugarcane smut) accessed in the different producing regions of Brazil, was investigated to establish a more efficient system of resistant/tolerant genotypes. The results will contribute to sugarcane cropping, as well as to keep Brazil in the leading position in the production of sugar and ethanol.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

Crosses were made between sugarcane wild accessions and cultivars and/or elite clones in order to obtain families to select clones with agro-energetic potential. This process was made through hybridization, introduction and selection of clones that are used as parents in the IAC Energy Cane Project, totalizing 207 genotypes. These genotypes have high biomass associated with higher fiber content (around 20%) in the stalk compared to conventional sugarcane populations. The chemical characterization of the fiber revealed for these genotypes a very heterogeneous structural composition of its components. This fact gave rise to a proposal of classification model based on the fiber composition (cellulose, hemicellulose and lignin). This information can be applied to the planting schedule of the cultivars in the future biorefineries, once the cultivars, by itself, could inform the average percentage of 6 carbon sugars (cellulose), 5-carbon sugars (hemicellulose) and non-fiber sugars (lignin).

In order to introgress *S. spontaneum* genes into commercial sugarcane cultivars to meet the new bioenergy market demand, wild accessions of the Saccharum Complex have been selected, imported, quarantined and released to compose the IAC Germplasm Bank. According to this dynamic, the IAC germplasm collection holds, at present, more than 400 genotypes imported from USA and Australia coming from various projects and partnerships established by the IAC Sugarcane Breeding Program.

Thus, this work encompassed the introgression practice as from technical criteria, evidencing a concern, not only restricted to the germplasm acquisition, but also to their maintenance and characterization to be used in the hybridization process. These actions will allow, in short and medium term, meet the demands of the Research and Development areas, especially the sugarcane production sector, transforming science into technology innovation.

MAIN PUBLICATIONS

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