

## SUSTAINABLE BIOENERGY SUGARCANE BREEDING AND CULTIVAR DEVELOPMENT

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The sugarcane breeding program of the Agronomic Institute of Campinas (IAC) has developed cultivars adapted for various edaphoclimatic conditions of the Brazilian producing regions. With the changing context for sugarcane production, with an increasing demand for high potential to produce primary energy, a new sugarcane biotype is emerging based on cultivars with increased sugars and total fiber production. Further, the large-scale adoption of mechanical harvesting system in Brazil may promote changes in the pathosystems, with emergence of known and new diseases, a condition that must be considered by breeding programs. Disease resistance is the method of choice to control most pathogens, and it is considered a fundamental aspect in the varietal development, but it has been treated superficially in most breeding programs in Brazil. This proposal suggests a reorientation of the current sugarcane breeding selection processes to attend the new bioenergy demand, by acting in four research topics. The first one is based upon the characterization and selection of clones in advanced stages of experimentation, which adjust to the primary energy potential definition of each selected line. For this, agronomic, phytopathological and molecular characterizations are proposed. The



Figure 1. Photoperiod facility for flowering induction and hybridization

second is applied at the first breeding stages, to utilize a combined selection process to identify and select parents more efficiently for generating progenies with high bioenergy potential. In the third topic, it is proposed to start a genetic introgression program among commercial varieties and *Saccharum spontaneum* genotypes, to promote the incorporation of new genes for sucrose and biomass accumulation, resistance to pests and diseases and adaptation to 'Brazilian cerrado' regions ('drought-prone environments'). The last one aims to investigate the existing genetic diversity of the main sugarcane pathogens in the distinct Brazilian producing regions, to enable a more efficient selection of resistant/tolerant genotypes. The results should contribute with sustainable sugarcane cultivation, while contributing to keep the Brazilian leadership in sugar and biofuel production.

## SUMMARY OF RESULTS TO DATE AND PERSPECTIVES



*Figure 2. Nucleus of sugarcane seedling production*

- Establish a collection of parents with high potential to generate families with high performance on sucrose and biomass production;
- Promote germplasm enrichment in Brazil, through the introduction of new materials;
- Identify and characterize new sources of germplasm;
- Promote the broadening of the genetic base of IAC varieties;
- Establish procedures for synchronization of flowering under controlled conditions, allowing interspecific crosses under Brazilian condition;
- Establish methods to diagnosis genotype responses to the main pathogens of sugarcane;
- Recognize pathogen diversity and population structure in main producing regions to help breeding for disease resistance;
- Identify genotypes resistant to pests, nematodes and diseases, target of this project;
- Disseminate the results obtained on national and international meetings and on journal of selective editorial policy.

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