ABSTRACT

The main objective of this work focuses on the use of biotechnology to develop new varieties of sugarcane for increasing productivity as well as the genetic variability that is narrow in this crop. With this purpose we have evaluated the genetic diversity in a population of 204 varieties (putative use as parental), using three molecular markers (CV29, CV37 and CV38) which showed an average polymorphic information content (PIC) of 0.37 indicating that they were able to identify polymorphisms in the population. After calculating the genetic similarity between the varieties and based on it, they were organized into 20 groups. Moreover, the *Bru1* marker associated with resistance of a fungal disease known as brown rust was used to analyze 303 varieties (including the 204 previously used). We obtained amplification in 77. The comparison with phenotypic data recorded during four years at two locations confirmed that these 77 varieties were resistant. However, those that did not amplify showed resistance and susceptibility (in 7%), indicating the putative presence of different alleles of resistance. With the above information we design and conduct 22 cross whose offspring F_1 were evaluated for four consecutive years recording with the average of each family to features like Brix (%), plant height, stem diameter, number of stems per meter and incidence of major diseases. From 22 crosses, 18 families showed brix equal or higher than CP72-2086 (the control variety), indicating that could overcome their sugar yield as a result of higher sugar content in their stems, although did not exceed in mass of cane. Several varieties with high Brix and tolerance to different diseases have been selected.

Another important problem in sugarcane is the propagation of materials from plants that were pathogen infected but do not manifest disease symptoms. In this work the DBIA (Dot Blot Immunoassay) methodology and the PCR was used for detect *Xantomonas albilineans*; RT-PCR was used for detect SCYLV (Sugar Cane Yellow Leaf Virus). We performed a Radom screening to evaluate the incidence of both pathogens confirming their presence in plants symptomless. Sequencing *X. albilineans* isolates we found that in Guatemala a minimum of two strains are present. We have compared termoterapy in combination or not with meristem culture for plant sanitation. Whereas meristem culture was more appropriated

for rescue plants free of *X. albilineans*, thermotherapy is sufficient for obtaining virus (SCYLV) free plant. The achievement of pathogen free plants let us to use *in vitro* culture techniques for conservation and micropropagation. Sanitated plants are maintained *in vitro* at a temperature of 18ºC. We evaluated several factors that may influence the adventitious regeneration from leaf explants (that may increase multiplication). These factors included genotype, explant position, combinations of growth regulators in the induction medium and auxin type for rooting. A great influence of genotype was manifested as well as the position of the explant and the concentration and type of some growth regulators were also influencing both the percentages of induction and subsequent development of the plants. In the best combination 32 plants per explant were regenerated. The protocols developed in this work are of interest to increase multiplication rates of sanitized materials and are a good base to use them in the future sugarcane improvement through genetic transformation.