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Efficiency of Hydrothermal Treatment in Cane Production and Control of Xanthomonas Albilineans in Categorized Sugar Cane Seed

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Abstract

The efficiency of the hydrothermal treatment was determined in the seed reproduced by cuttings, for which an experiment was planted in Sancti Spiritus in November 2018, harvested in plant cane and sapling at 10 months of age. Three hydrothermal treatments were evaluated in five cultivars. The variables studied were diagnosis by UMELISA against foliar scald, staining of the xylem vessels (ex officio diagnosis) and agricultural yield. A randomized block design with three replications was used, and analysis of variance, comparison of means and conglomerate tests were performed. The results showed that the treatment of 51°C at 1 hour was superior in cane production, that there were no differences in the diagnosis by UMELISA, in the ex officio diagnosis all the samples reached more than 85% aptitude and the feasibility of the first shoot as seed, there were economic gains

Introduction

In the cultivation of sugarcane, the use of high-quality propagative material is of utmost importance, since it is used for the reproduction of plantations [1]. It is important to highlight at the same time the problems that cultivars present in sprouting when they are subjected to long thermal treatments, for which it is necessary to evaluate the effectiveness of this, both in the sprouting of the buds, in the effectiveness of the control of the diseases and agricultural production. The work aimed establish a methodology that allows determining the effectiveness of the hydrothermal treatment time in the percentage of sprouting, cane production and disease control of the Basic and Registered Seed I propagated by cuttings

Materials and Methods

The study was developed in the Basic Seed Bank (BSB) of Sancti Spiritus, on Brown soils with carbonate [2]. An experiment was planted in November 2018 and harvested in plant cane in September 2019, while in sapling it was in July 2020 in both strains with 10 months of age. Five cultivars (C86-12, C86-156, C90-469, CP52-43 and C8-357) and three hydrothermal treatments (T1 50.5°C for 3 hours, T2 50.5°C for 2 hours and 51°C for 3 hours) were studied. 1 hour), the area of the experimental plots was 48 m². The variables studied were agricultural yield (t cane ha⁻¹), diagnosis by UMELISA for the presence of X. albilineans, staining of the xylem vessels (ex officio diagnosis, TVX), the percentage of sprouting at 60 days of planting, the randomized block design with three repetitions was used, analysis of variance, simple and bifactorial, mean comparison test was performed by Multiple Range test with Tukey's test (p<0.01 and p<0, 05) and the Cluster Analysis, in this analysis the farthest neighbor method with the Euclidean distance was used.

Results and Discussion

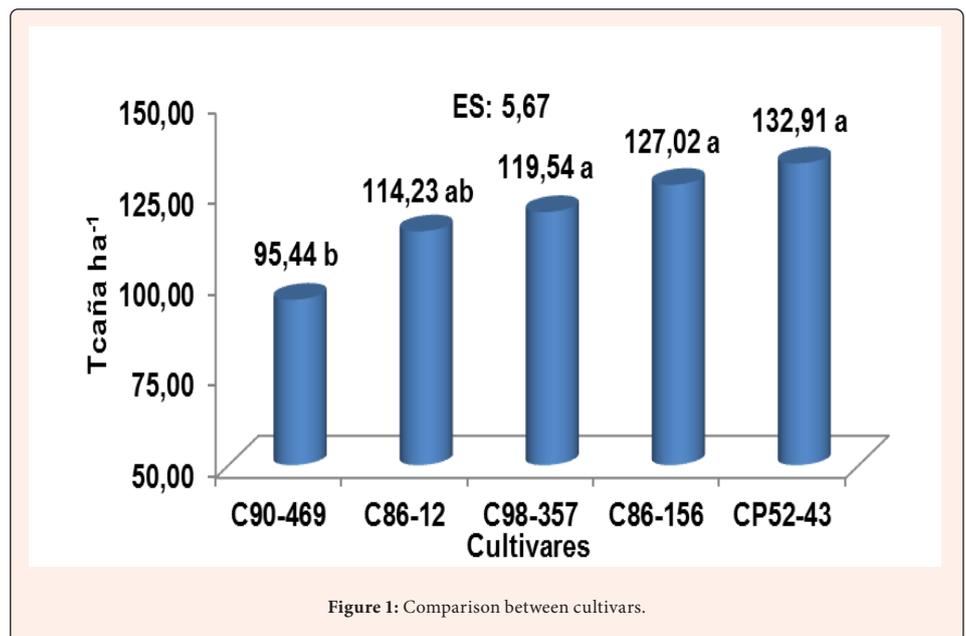


Figure 1: Comparison between cultivars.

The analysis of variance for the t cane ha<sup>-1</sup> in the plant cane strain expressed significant differences for the cultivar variables and treatments. Genotypes CP52-43, C86-156 and C98-357 outperformed C90-469, while C86-12 achieved comparable results with the 4 varieties mentioned above (Figure 1). The dissimilar behavior between the genotypes in any variable studied is an expected result because they are genetically different and although they come from a narrow genetic base as pointed out by [3], sugarcane is a complex polyploid that allows expressing its differences. The different behavior between the treatments confirmed that as long hydrothermal treatments increase, sugarcane production decreases.

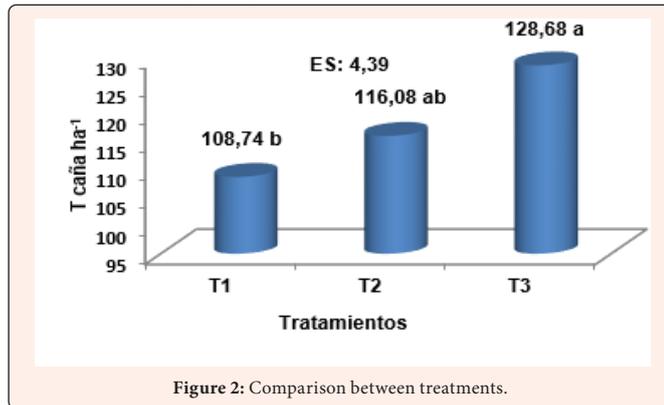


Figure 2: Comparison between treatments.

Staining to determine the percentage of xylem vessels offered significance for cultivars and treatments (Figure 2,3) expressed that C90-469 outperformed the rest of the genotypes studied, reaching the lowest values for C86-12, all higher than 85%, which ratified the quality of the seed and the rigor of the hydrothermal treatment carried out. (Figure 4) revealed that treatment 3 (51 C0 for 1 hour) outperformed the long hydrothermal treatments (50.5 C0 for 2 and 3 hours).

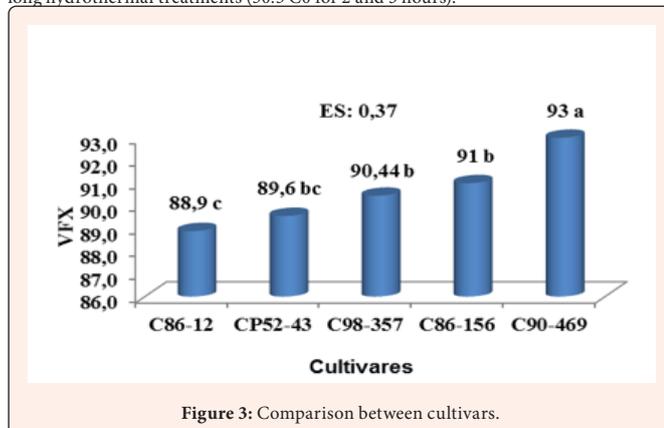


Figure 3: Comparison between cultivars.

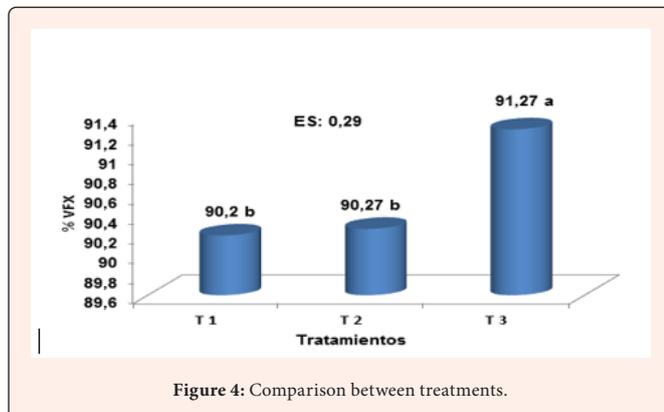


Figure 4: Comparison between treatments.

The diagnosis by UMEELISA provided that of 45 observations only 2.2% (one case) had the presence of the bacterium *Xanthomonas albilineans* (Ashby) Dowson, while in the ex officio diagnosis it reached values of 92% aptitude of the blood vessels. xylem, it is noteworthy that of the 45 observations, only the cultivar C86-156 with the treatment at 51°C for one hour was positive, a variety susceptible to this pathology [4]. The diagnosis by UMEELISA allows diagnosing the presence or absence of the bacterium, but not qualifying the quality of the seed, so the combination of the two diagnoses is important for decision making. In the sucker strain, the analysis of variance for the t cane ha<sup>-1</sup> exhibited significant differences for the cultivar factors, treatments and the interaction cultivar by treatment. In the cluster analysis, the formation of three groups was appreciated. Group II achieved the highest agricultural production made up of genotypes C86-12, C90-469 and C86-156 with treatment III, it was also integrated by the last cultivar mentioned above with treatment II. The least productive results were from group III, composed mainly of three cultivars with long hydrothermal treatments (Treatments I and II). These results confirm that treatments of 50.50C for three and two hours affect sprouting, which is later reflected in the population and in sugarcane production.

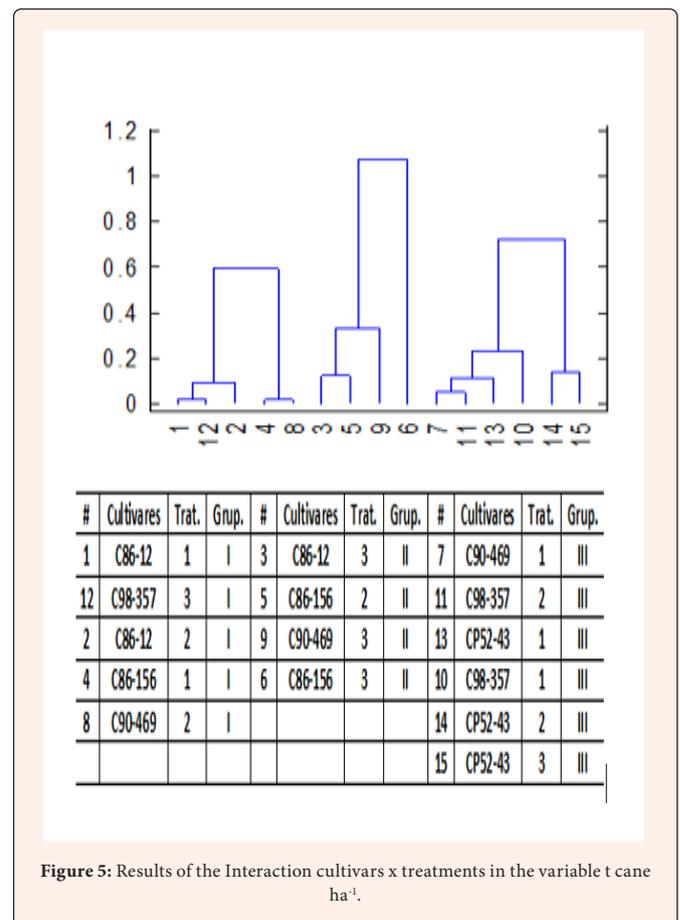


Figure 5: Results of the Interaction cultivars x treatments in the variable t cane ha<sup>-1</sup>.

The analysis of variance in shoot expressed significant differences for the cultivars in the serological diagnosis by UMEELISA and for the treatments in the percentage of functional xylem vessels. The genotypes C86-12, C98-357, C90-469, C86-156 outperformed CP52-43, which was the one with the highest presence of the bacterium (Figure 5). Of the five varieties studied, three are resistant or tolerant to foliar scald while C86-156 and CP52-43 are susceptible, both were diagnosed as positive the first on one occasion while the second on five (13% of the total observations). , however, in all cases the percentage of xylem vessels was greater than 85% functionality, which confirms the quality of the seed for use as planting material and the importance of combining the two diagnostic methods for taking of decisions. In (Figure 6,7) it was observed that treatments III and II outperformed treatment I, however all exhibited

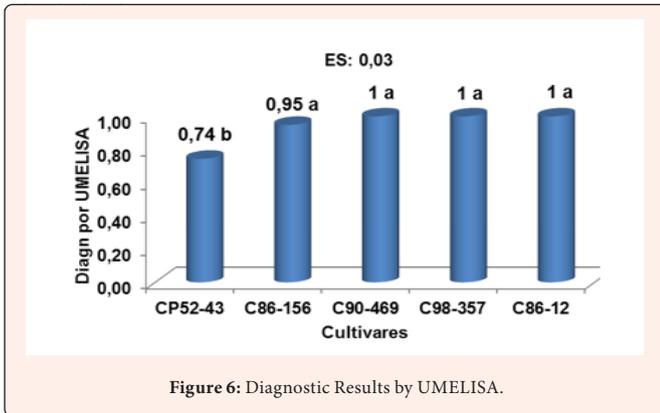


Figure 6: Diagnostic Results by UMELISA.

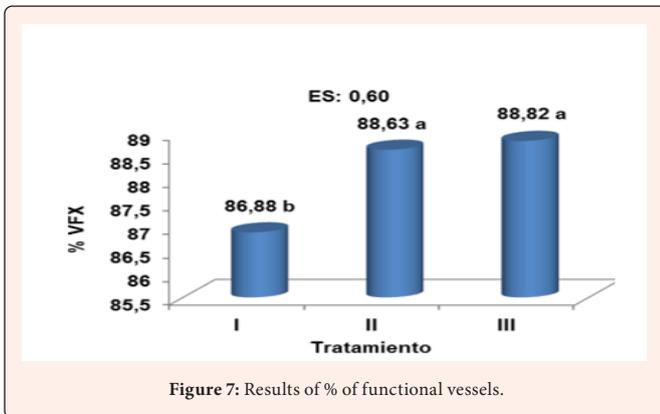


Figure 7: Results of % of functional vessels.

### Conclusions

The diagnosis by UMELISA showed that only 2.22% of the cases in plant cane had the presence of the bacterium *Xanthomonas albilineans* (Ashby) Dowson in the leaves, while in the shoot it was 13.33%; however, the aptitude of the xylem vessels in the two strains studied was higher than 85 %, which confirms that the treatment time is not the determining factor in the eradication of the appearance of the bacteria and in the quality of the seed. Sugarcane production (t cane ha<sup>-1</sup>) in the plant cane strain was higher for treatment III (510C1 hour) and in the sucker three of the four members of Group II (the one with the highest sugarcane yield) of the Cluster belong to treatment III. The use the first shoot as seed is possible as long as its production is rigorously worked on, since it presented proven phytosanitary quality.

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