# NON THERMAL-PLASMA AS NOVEL PRE-TREATMENT OF SOTOL BAGASSE *(Dasylirion* sp.*)* FOR LIGNIN REMOTION

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**Introduction.** De-lignification process of lignocellulosic materials is an important step for fermentable sugars release. The conventional process presents drawbacks such as lengthy procedures and generating acidic/alkaline solutions, which can harm the environment. Recently, plasma treatment has appeared as an alternative to traditional treatments due to its capacity to modify organic surfaces, producing changes in the lignocellulosic material [1]. In this context, the aim of the present work was to assess the effectiveness of non-thermal plasma in removing lignin from sotol bagasse (SB), a by-product of sotol spirit production.

**Methods.** SB was collected, dried, milled, and sieved. Chemical composition of SB was carried out following the methodology reported by Sluiter *et al*. [2]. A non-thermal plasma system was used to treat SB. Samples (0.1 g) were treated on a reactor consisting of a glass container coupled to a vacuum pump. A power source was used to induce plasma conditions, once vacuum conditions were achieved, the reactor kept it in touch with the electric field generated by the power source. Treatments were carried out in triplicate at an induction frequency of 500 Hz in time intervals of 1, 3 and 6 minutes. The power was maintained at 60 W during all the experiments. Treated samples were characterized and lignin content was determined. Pretreated SB was further treated via enzymatic hydrolysis in a 125 mL Erlenmeyer flask at 5% solid loading with 20 FPU/g of cellulases enzyme per gram of dry bagasse, at 50 ºC for 24 h. The phenol-sulfuric acid method was employed to determine the total released sugars.

**Results.** Raw SB presented 42.2±7.3, 24.1±0.9 and 15.3±0.2% for lignin, cellulose and hemicellulose fractions respectively. These results were similar to those reported by Gonzalez-Chavez *et al.* [3]. Plasma-treated samples of SB presented a lignin content of 28.3±1.3, 28.2±0.4 and 28.5±0.4% after 1, 3 and 6 min of treatment, respectively. These values corresponded a lignin removal of 32.6±3.1, 32.7±1.3 and 32.1±0.5 % respectively. Based on the results, a treatment time of only 1 minute is sufficient for maximum removal as it did not have a significant effect ($p<0.05$). Miranda et al (2019) reported a high lignin solubilization (58.5%) for sugarcane bagasse after 2 hours of liquid phase-plasma treatment [4]. Plasma treatment for one minute increased total sugar release by approximately 5 times compared to non-treated samples, reaching a maximum of 30.6±1.1 g/L. Sakai *et al.* [5] reported 1.8-fold increase in reducing sugars after 20 minutes of plasma-treated wheat straw; similarly, Ravindran *et al.* [6] reported a 2.1-fold increase in fermentable sugars after enzymatic hydrolysis for samples of brewer spent grain treated by plasma [6].

**Conclusions.** The study has provided evidence of the effectiveness of cold plasma treatment in removing lignin from SB. This suggests that plasma pre-treatments could serve as a viable and promising alternative for delignifying sotol bagasse. It is hoped that this can pave the way for further advancements in the field of delignification, and ultimately lead to a more sustainable and efficient approach.

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**References.**

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