

**Title: Effects of addition ashes in the biochemical potential of methane production from vinasse**

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Nowadays, human activities are generating a huge amount of waste. Among these, in the sugarcane industry, one residue that needs attention is the vinasse. The methane production from the vinasse has been shown to be a viable process for the digestion of organic compounds. In addition, there is the possibility of reusing the wastewater. This can result in great environmental benefits. For these reasons, the aims of this work was to study the biogas formed from the methanogenesis of vinasse, using different concentrations of chemical oxygen demand (COD) and addition of bagasse ash and hardwood ash as tamponates compounds. The tests were performed in batch reactors of 250 mL reaction volume and 250 mL of headspace. The initial inoculum was from batch reactors used in a previous study. There were four treatments: Vinasse 25 g /L of COD with 5% bagasse ash (T1); Vinasse 25 g /L of COD with 5% wood ash (T2); Vinasse 25 g /L of COD ashless - control 1 (T3 ); Vinasse 15 g /L of COD with 5% bagasse ash (T4); stillage 15 g /L of COD with 5% wood ash (T5); Vinasse 15 g / l of COD ashless - Control 2 (T6). All treatments received 25 mL of inoculum and 225ml of vinasse with their concentrations of COD and ash. The reactors were maintained in continuous stirred, at 28 °C, for 61 days. The production of CH<sub>4</sub> and CO<sub>2</sub> was analyzed. Furthermore, the pH analysis was performed once a day and the determination of COD once a week. At the beginning of anaerobic digestion, CH<sub>4</sub> was almost zero in all treatments and CO<sub>2</sub> corresponded most of the volume. However, these values were reversed during the kinetic. The variation of the proportion of CH<sub>4</sub> and CO<sub>2</sub> during kinetic was closely related with pH. The highest levels of CH<sub>4</sub> were achieved in the ash treatments T2, T4 and T5 reaching 80% of the composition. In these treatments, ash buffered the pH of the system, allowing acetogenesis and methanogenesis. The reactors with hardwood ash, had the highest CH<sub>4</sub> production values between all the treatments studied, reaching values of 500 mL of methane after 36 days. The T5 treatment had the highest percentage of reduction of organic matter available, where 72% of COD was consumed. All the ash buffered pH in reactors systems, otherwise, T3 and T6 failed to recover its pH after hydrolysis and acidogenesis, consequently methanogenesis was almost zero during this kinetics. Therefore, it is concluded that the best treatment was T1.

**Keywords:** vinasse, biodigestion, methanogenesis

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