TITLE: Biogas production from vinasse supplemented with micronutrient solution

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ABSTRACT:
The sucroenergetic industry has been facing many challenges, such as reducing the costs for waste management. In ethanol production from sugarcane, vinasse is the most important wastewater due to its high volumes, high polluting potential, high organic matter, potassium and sulphate contents. In Brazil, vinasse fertirrigation in sugarcane fields is very common but the technique has had increasing costs in the latest years, so the sucroenergetic sector seeks for alternative and more efficient uses for vinasse. Anaerobic digestion (AD) for biogas production is a very suitable technology for processing vinasse and it is a self regulated system with different microbial groups. The archeas have lower growth velocities but they are the ones responsible for producing methane, the main energetic compound in biogas. In this study we aimed to achieve higher biogas volumetric production by supplementing influent vinasse with mineral cofactors that are important to archeas. Experiments were carried out in two 50 L UASB reactors, both in bed batch system, at mesophilic conditions (38ºC). Influent vinasse with COD concentration of 30429,41 mg O_2 L^{-1} was supplemented with increasing concentrations of a commercial solution (Cu = 5,45; Zn = 10,91; Fe = 17,02; B = 9,36; Co = 3,05; Mn = 6,03; Mo = 4,04; Se 1,12; W = 30; Ni = 6,54; As = 0,08; Cd = 0,11; Pb = 0,21; Cr <0,05; Hg <0,02 mg Kg^{-1}, respectively), diluted to final concentration of 6.5 ppm, 13 ppm, 26 ppm and 52 ppm in vinasse. In parallel, a control treatment was carried out and it consisted of a similar UASB reactor fed with vinasse only, at COD concentration of 30429,41 mg O_2 L^{-1}. Biogas production for the supplemented system was 75.90 ± 4.11 L day^{-1} and 75.47 ± 4.04 L day^{-1} for the control treatment. Both systems also presented similar COD reduction, such as 82.70 ± 4.90 % and 81.53 ± 4.54 % for the supplemented and control treatment, respectively. No significant difference was determined between treatments. However, due to our results, it has been determined that instead of testing a complex mixture of micronutrients, Mo, Ni, Fe and Se have been chosen to be individually evaluated, as well as a possible interaction between them on biogas production. Higher concentrations of micronutrients will also be tested. It is expected that by evaluating micronutrients individually it will be possible to propose a simpler and cheaper system of vinasse supplementation for more efficient biogas production systems.

Keywords: Anaerobic digestion, vinasse, supplemented, micronutrients.

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