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Experimental Results from Anaerobic Co-Digestion of Corn Steep Liquor and Agricultural Wastes for Biohydrogen Production

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Extended Abstract

As a sustainable energy source with high energy yield, hydrogen is a promising alternative to fossil fuels [1]. Co-digestion involves simultaneous fermentation of multiple substrates and offers opportunities to improve biohydrogen production through synergistic interactions between different waste materials [2]. In this study anaerobic co-digestion of corn steep liquor and different agricultural wastes was investigated aiming maximization of biohydrogen production.

The process of the biohydrogen production needs proper selection of substrates and also the right conditions for ensure stabilization of the process. Proper temperature and pH is not only necessary to provide optimal environment for hydrogen producing bacteria but also to prevent of methanogenic bacteria growth in the medium [3]. The experiments were conducted using laboratory installation consist of four laboratory bottles with total volume of 500 cm^3 hermetically enclosed with butyl rubber stoppers. In the rubber stoppers vents for biogas evacuation were made. The work volume was established at 200 cm^3 and the temperature of 35°C was maintained using water bath, while pH was kept at 5.5. The digestion of corn steep liquor was realized using different agricultural wastes as co-digester: wastes from potatoes, tomatoes and cucumbers and cattle manure. The two substrates were mixed in different ratios: 1:1; 1:2 and 2:1. The investigated organic load values were 5, 10, 15, 20 and 25 g/L. The dynamics of H_2 production is measured at 24, 28 and 72 h from the beginning of the experiment.

As a result of the experiments carried out in this way, it was found that the best result in terms of biohydrogen yield was the combination between corn steep liquor and cattle manure as substrates at ratio 1:1. The organic load of 10 g/L had a maximum hydrogen concentration and production rate of 14.5% and 190 mL per day, respectively. In our future work, the possibilities for application of digestate for recycling in the two phase system inside bioreactors will be studied.

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