

Effect of substrate concentration and retention time on the acidogenic fermentation of food waste

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Abstract

Volatile fatty acids (VFA), ethanol and lactic acid are intermediate liquid products in anaerobic digestion (AD), whose economic value is higher than methane. They are currently produced from petrochemical sources and food crops and their industrial production from AD is not yet economically feasible, because of high recovery costs and product inhibition. Hence, a concentrated substrate, rarely investigated, would facilitate their recovery and lead to a higher volumetric productivity. To maximise yield, concentration and productivity, batch and semi-continuous reactors were run, investigating different food waste (FW) concentrations, hydraulic and sludge retention times (HRT and SRT). For the process economy, room temperature was maintained and pH was uncontrolled, reaching acidic values that inhibit methanogens. Lactate was the main product, representing 80% in most experiments, followed by acetate, most probably due to the low pH (around 4). Substrate concentrations between 429 and 27 gCOD/l were assessed in batch runs. Results achieved with a more concentrated FW have so far been promising, reaching a maximum product concentration of 60 g/l with 429 gCOD/l of feed and similar yields at all concentrations (18-8% COD/COD). Different HRT and SRT were investigated in combination with different substrate concentrations. A maximum product concentration of 16 g/l and productivity of 6 g/l*d were obtained in a sequencing batch reactor (SBR) with HRT of 2 days, SRT of 5 days and fed with 107 gCOD/l. However, maximum yield of 27% COD/COD was achieved in a continuous stirred tank reactor (CSTR) with HRT of 30 days, fed with 54 gCOD/l.



Biography:

Serena Simonetti is a second year PhD student in Chemical Engineering at the University of Aberdeen, with expertise in recovery of energy and materials from waste. She studied Industrial Chemistry (MSc) at the University of Rome “La



Sapienza” with specialisation in Environment, Resources, Energy and Safety. She is co-author of a paper concerning the use and characterisation of biochar for anaerobic digestion, result of a one-year thesis project carried out at the National Research Council- Water Research Institute of Rome. She also has a three-month research experience at the Helmholtz- Centre for Environmental Research of Leipzig.

Speaker Publications:

1. “Enhancing methane production from food waste fermentate using biochar: The added value of electrochemical testing in pre-selecting the most effective type of biochar”; December 2017 Biotechnology for Biofuels 10(1)
DOI: 10.1186/s13068-017-0994-7
2. “Anaerobic digestion of food waste for the production of chemicals.”;

[24th European Biotechnology Congress](#); September 23-24, 2020, Webinar

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