

Assessing the effect of phenolic hydrochars in the anaerobic co - digestion of waste activated sludge and cheese whey wastewater

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Lesvos island has a well-developed food industry, and as a result several wastewater streams need to be valorized and properly disposed. The main sources of wastewater come from the food industries are the olive mills, the wineries, and the dairy processing facilities. Production of biogas from food industry wastewater (FIWW) can be a significant source of energy and a first steps towards the green energy transition of the island. In the framework of Circular Economy FIWW was treated by means of hydrothermal carbonization for the production of hydrochar, which was added to BMP experiments of said FIWW. OMWW and wine sludge were treated in a 4570A Parr hydrothermal reactor for a residence time of 2 hours, temperature of 250 °C and pressure of 55 bars. Wheaton bottles with septum seals were utilized for the anaerobic co-digestion of locally sampled cheese whey wastewater with added hydrochar. In all experiments 5 ml of CWWW was treated (1:2 ratio with sludge) along with different added hydrochar percentages, i.e., 50 g, 100 g and 250 g respectively. This study presents the results from hydrothermal carbonization of OMWW and wine sludge with a focus on the quality of the produced hydrochar. The biomethane potential of the co-digestion was assessed by BMP tests, and the final digestate was assessed for the content in VFAs by means of an Agilent GC with a DB-WAX column. Analysis also included the TS/ VS content, COD and Total Phenolic Content of the digestate. HC from WS had a heating value of 28.05 MJ/ kg, while HC from OMWW had a slightly lower heating value of 26.55 MJ/ kg. The highest biogas production was observed for the samples with 100 and 250 mg of WS HC. The sample with 100 mg of HC from OMWW performed also well but the addition of HC from 100 to 250 mg had a mitigating effect on biogas production. Butyric acid was the predominant VFA followed by acetic acid for all cases and samples. The presence of hydrochar did not significantly alter the concentration or the types of produced VFAs from AD.

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