

EVALUATION OF VOLATILE FATTY ACIDS IN THE FIRST STAGE OF THE TWO-STAGE ANAEROBIC DIGESTION OF CITRUS WASTE

ABSTRACT

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Citrus waste accumulation creates a serious problem, not only health but also for the environment. Due to its high organic content and high moisture, the most promising solution to treat citrus waste is anaerobic digestion. However, the presence of limonene in citrus waste and the accumulation of volatile fatty acid (VFA) may inhibit the digestion. One way to solve the problems is by conducting anaerobic digestion into two stages. The hydrolysis, acidogenesis, and acetogenesis steps (1st stage) was separated from the methanogenesis step (2nd stage). In this research study of 1st stage digestion of citrus waste was conducted. Basal medium, 1.5 g VS of inoculum and 4.5 g VS of citrus waste were added in the batch reactor. The digestion process was carried out at 55°C for four days. The reactor was set into ‘anaerobic’, ‘semi-aerobic’, and ‘passive-aerobic’ condition to evaluate the effect of the presence of O₂ in the digester. Maximum total sugar production of the citrus waste digestion under ‘anaerobic’, ‘semi-aerobic’, and ‘passive-aerobic’ condition was 294.3 g/l, 244.7 g/l, and 220 g/l respectively. Maximum total vfa production of the citrus waste digestion under ‘anaerobic’, ‘semi-aerobic’, and ‘passive-aerobic’ condition was 3.8 g/l, 2.6 g/l, and 3.2 g/l respectively. Redox potential in citrus waste system was negative at the initial stage and changed to positive in the last day that indicates the degradation occurred. The presence of oxygen in ‘semi-aerobic’ and ‘passive-aerobic’ system inhibited the 1st stage microorganism metabolism.

Keywords: Anaerobic digestion, two-stage, batch, citrus waste, limonene, volatile fatty acid, sugar