

Semi and continuous anaerobic treatment of palm oil mill effluent for the production of organic acids and polyhydroxyalkanoates.

ABSTRACT

The aim of this study was to improve organic acids production in semi and continuous anaerobic treatment of Palm Oil Mill Effluent (POME) using a locally fabricated 50 L Continuously Stirred Tank Reactor (CSTR). The organic acids obtained were then used for polyhydroxyalkanoate (PHA) production by *Ralstonia eutropha* ATCC 17699 in a 2 L bioreactor. The conditions used in the anaerobic treatment were controlled pH 6.5, sludge to POME ratio at 1:1 and Hydraulic Retention Time (HRT) of 4 days. The organic acids obtained were about 15 g L⁻¹ at steady state for both treatments and the organic acids yield (based on BOD) was 58.3%. The selected organic acids obtained were acetic (51.5%), propionic (27%) and butyric (21.5%) acid. The recovery of the clarified and concentrated organic acids from the treated POME was made using a two-steps evaporation process. The clarified organic acids (distillate) obtained were comprising of 44.6, 20.1 and 22.5 g L⁻¹ acetic, propionic and butyric acids, respectively with a recovery of 76%. The organic acids collected were then used for polyhydroxyalkanoates accumulation by *Ralstonia eutropha* ATCC 17699 using pH stat fed-batch fermentation under nitrogen limitation of C/N 40 in a 2 L fermenter. The highest PHA concentration of 11.4 g L⁻¹ (>90% w/w) was achieved in this process.

Keyword: Palm oil mill effluent; Organic treatment; Organic acids; Retention time; Polyhydroxyalkanoates; Distillation.