

# Enhanced Bioenergy Production from Palm Oil Mill Effluent by Co-digestion in Solar Assisted Bioreactor: Effects of Hydrogen Peroxide Pretreatment

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## ABSTRACT

Pretreatment is significant for the bioenergy yield enhancement by anaerobic co-digestion (ACoD) process. Oxidization by hydrogen peroxide (OHP) had substantial impacts on biological break down through pretreatment of substrate and bioenergy production by ACoD methods. It is considered as an environmentally friendly and economical pretreatment method of ACoD for different wastewater treatment. This work aims to study the potential effects of OHP pretreatment in treating palm oil mill effluent (POME) for greater bioenergy yield using a solar assisted bioreactor (SABr). In this study, the solar panel first converted solar radiation into electricity, which warmed up POME and cattle manure (CM) mixture to keep the reactor in mesophilic temperature. The operation was done semi-continuously, and the ACoD operation was analysed at a 50:50 mixing ratio for POME and CM. The Fenton oxidation effects of 1.00% OHP doses with 1 mM Fe<sup>3+</sup> on the POME at 30 min exposure for COD and TOC removal were 33.80% and 28.31%. The improvement of biodegradable dissolved organic carbon (BDOC) was 59% more for POME at 1.00% OHP doses, which were maximum for any other OHP percentage dose and thus BOD/COD was also enhanced up to 0.72 for POME. Biogas and methane production can be enhanced up to 46.00% and 64.83% if pretreated by 1.00% OHP doses. The methane composition is also enhanced up to 72.4% compared to non-pretreated which was 64.13%. Kinetic study of potential methane production from POME was determined for measuring final methane production as well as kinetic constants. The consequences of OHP pretreatment for POME subsidize advantageous evidence for the effectiveness of the ACoD process for the treatment of POME.

**KEYWORDS:**

Hydrogen peroxide pretreatment; Solar assisted bioreactor; Anaerobic co-digestion; Palm oil mill effluent; Cattle manure; Bioenergy production

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