

Preliminary Studies for Production of Ethanol from Oil Palm Frond Squeezed Juice

Mallika Tapanwong¹, Rayakorn Nokkaew¹ and Vittaya Punsuvon^{1,2*}

¹Center of Excellence-Oil Palm Kasetsart University, Bangkok 10900 Thailand

²Department of chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand

E-mail: fscivit@ku.ac.th

Abstract

This work investigated the utilization of oil palm frond (OPF) squeezed juice for ethanol production using *Saccharomyces Cerevisiae* TISTR 5339 without supplemented chemicals and nutrients. The significant amounts (5.79% w/v) of ethanol were detected at 72 h of fermentation when starting of OPF juice containing 17 brix sugar. The results indicated that OPF juice had the potential renewable source for ethanol production.

Keywords: Ethanol, oil palm frond, *Saccharomyces Cerevisiae* TISTR 5339

Introduction

Oil palm frond (OPF) is obtained during pruning for harvesting fresh fruit bunch (FFB), therefore it is available daily. OPF is currently under-utilized as the plantation owners believe that all the OPF is necessary for nutrient recycling and soil conservation (Hassan et.al, 1994). Hence, pruned fronds are just left in the plantation. Our experiment showed that OPF contained high carbohydrates in the form of glucose. Therefore OPF can be utilized as raw material for ethanol instead of the nutrient recycling product. Production of sugar from dried OPF fiber has been recently reported by Goh (2010) involving the conversion of cellulose and hemicellulose into glucose and xylose through hydrothermal treatment followed by enzymatic hydrolysis. However, the methods used for converting OPF into sugar still involve the use of high temperature and pressure, and also cellulose degrading enzymes. Thus overall process is costly. There is a need for alternative process of producing renewable sugar from OPF as fermentation feedstock. Our studies found that the pressing process of fresh OPF can produce the squeezed juice with high glucose content.

The main objective of this work was to investigate the possibility in producing ethanol from OPF using simple pressing machine.

Methodology



Figure 1 Overall process diagram

Ethanol Calculation

$$\text{Ethanol content (\%)} = \frac{\text{Area of ethanol from GC} + 8.477}{1169}$$

Results and discussion

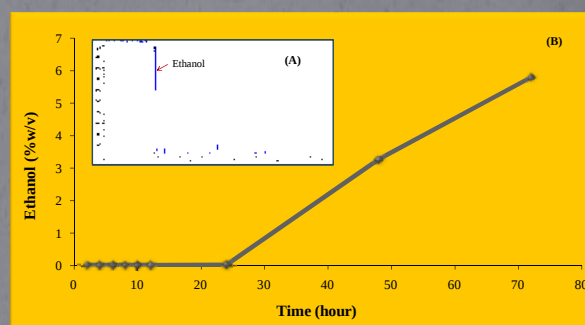


Figure 2 Ethanol production from OPF juice by *S. cerevisiae* TISTR 5339; (A) Chromatogram of ethanol; (B) Result of ethanol fermentation for 72 h.

Figure 2, the highest content of ethanol was (5.79%) obtained at 72 h of fermentation. Interestingly that ethanol could be produced from OPF juice without supplemented chemicals and nutrients. This indicated that OPF juice contained nutrients and mineral as well as amino acid which could be used for yeast growth. Our results were confirmed by the work of Nohd Zahari et. al. (2012) who studied the production of poly (3-hydroxybutyrate) from OPF juice. They indicated that OPF juice could be used as an alternative renewable carbon source for poly(3-hydroxybutyrate) production.

Conclusion

This preliminary study demonstrated the potential of OPF juice as a renewable fermentation feedstock for producing ethanol. A monomeric sugar can be obtained simply by pressing the OPF. The presence of mineral and nutrients in OPF juice is very benefit for yeast growth and cost reduction in ethanol production process.

References

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