# ABSTRAK


**Pemanfaatan Limbah Tandan Kosong Kelapa Sawit Sebagai Bahan Baku Pembuatan Bioetanol Dengan Metode Hidrolisis Asam**

(Putri Ramadani, 2025 : 56 Halaman, 9 Tabel, 31 Gambar)

Penelitian ini mengoptimalkan produksi bioetanol dari tandan kosong kelapa sawit (TKKS) melalui hidrolisis asam sulfat ($H_2SO_4$) dan fermentasi. Tujuannya menentukan pengaruh konsentrasi asam (0,5%, 1,5%, 2,5%) dan waktu hidrolisis (50, 60, 70 menit) terhadap kadar glukosa dan etanol. Hasilnya diharapkan meningkatkan efisiensi konversi limbah TKKS menjadi energi terbarukan, mendukung keberlanjutan lingkungan dan ketahanan energi. *Pretreatment* alkali (NaOH 0,6M, *microwave* 500W) Hidrolisis asam ($H_2SO_4$ 0,5-2,5%, autoklaf 50-70 menit) Fermentasi (S. cerevisiae, 5 hari) Distilasi dan analisis data. Variabel bebas menggunakan konsentrasi asam dan waktu hidrolisis Variabel tetap menggunakan kadar glukosa dan etanol. Data dianalisis secara kuantitatif menggunakan refraktometer brix dan refraktometer alkoholKadar glukosa tertinggi (6,8%) diperoleh pada hidrolisis $H_2SO_4$ 2,5% selama 70 menit, Kadar etanol optimal mencapai 12% dengan kondisi yang sama, Kondisi terbaik: $H_2SO_4$ 2,5% + 60 menit (glukosa 6,2%, etanol 10%), Konsentrasi asam lebih berpengaruh daripada waktu hidrolisis, Waktu lebih dari 60 menit berisiko menghasilkan senyawa inhibitor. Temuan utama terdapat bahwa Hidrolisis asam efektif untuk konversi TKKS menjadi bioetanol, dengan konsentrasi asam sebagai faktor paling berpengaruh. Kesimpulannya Kadar gula tertinggi (6,8%) dan etanol (12%) dicapai dengan $H_2SO_4$ 2,5% selama 70 menit Kombinasi optimalnya $H_2SO_4$ 2,5% + 60 menit (glukosa 6,2%, etanol 10%)



**Kata Kunci:** Bioetanol, TKKS, hidrolisis asam, $H_2SO_4$, fermentasi, *Saccharomyces cerevisiae*

## *ABSTRAK*

***Utilization of Empty Fruit Bunches of Oil Palm as Raw Material for Bioethanol Production Using Acid Hydrolysis Method***

(Putri Ramadani, 2025 : 56 *Pages*, 9 *Table*, 31 *Images*)

*This study aims to optimize bioethanol production from oil palm empty fruit bunches (EFB) through sulfuric acid ($H_2SO_4$) hydrolysis and fermentation. The objective is to determine the effects of acid concentration (0.5%, 1.5%, 2.5%) and hydrolysis time (50, 60, 70 minutes) on glucose and ethanol yields. The results are expected to enhance the efficiency of EFB waste conversion into renewable energy, supporting environmental sustainability and energy security. The process involved alkali pretreatment (0.6 M NaOH, 500W microwave), acid hydrolysis ($H_2SO_4$ 0.5–2.5%, autoclaved for 50–70 minutes), fermentation (using Saccharomyces cerevisiae for 5 days), followed by distillation and data analysis. The independent variables were acid concentration and hydrolysis time, while glucose and ethanol concentrations served as fixed variables. Data were analyzed quantitatively using a Brix refractometer and an alcohol refractometer. The highest glucose concentration (6.8%) was achieved at 2.5% $H_2SO_4$ for 70 minutes. The optimal ethanol concentration (12%) was also obtained under the same conditions. However, the most effective combination was 2.5% $H_2SO_4$ and 60 minutes, producing 6.2% glucose and 10% ethanol. Acid concentration was found to have a greater impact than hydrolysis time, and durations beyond 60 minutes risked generating inhibitory compounds. The main finding indicates that acid hydrolysis is effective for converting EFB into bioethanol, with acid concentration being the most influential factor. In conclusion, the highest glucose (6.8%) and ethanol (12%) levels were achieved at 2.5% $H_2SO_4$ for 70 minutes, while the optimal condition was 2.5% $H_2SO_4$ for 60 minutes.*



***Keywords****: Bioethanol, EFB, acid hydrolysis, $H_2SO_4$, fermentation, Saccharomyces cerevisiae*