ABSTRAK

PEMBUATAN BIOETANOL DARI LIMBAH KULIT NANAS MENGGUNAKAN PROSES DELIGNIFIKASI BERBASIS *DEEP EUTECTIC SOLVENT* (DES)

(Helen Chairunisa, 2026, 72 Halaman, 8 Tabel, 8 Gambar, 4 Lampiran)

Peningkatan kebutuhan energi dan menipisnya cadangan bahan bakar fosil mendorong pengembangan bioetanol sebagai energi terbarukan. Limbah kulit nanas merupakan biomassa lignoselulosa yang berpotensi sebagai bahan baku bioetanol, namun kandungan lignin yang tinggi menghambat proses hidrolisis. Penelitian ini bertujuan menganalisis pengaruh delignifikasi menggunakan *Deep Eutectic Solvent* (DES) berbasis ChCl:Asam laktat, menentukan kondisi optimum hidrolisis asam dengan variasi konsentrasi 3, 4, 5,6, dan 7 M HCl dan waktu hidrolisis 60, 90, dan 120 menit, serta mengevaluasi kualitas bioetanol berdasarkan SNI 7390:2008. Tahapan penelitian meliputi delignifikasi, hidrolisis, fermentasi menggunakan *Saccharomyces cerevisiae*, dan distilasi. Hasil menunjukkan bahwa delignifikasi menurunkan kadar lignin dari 23% menjadi 7% serta meningkatkan kadar selulosa dari 57% menjadi 60%. Kondisi optimum diperoleh pada hidrolisis HCl 6 M selama 90 menit dengan kadar glukosa 17,4 %Brix, kadar etanol hasil fermentasi 54%, dan kadar etanol hasil uji GC-MS sebesar 60,20%. Bioetanol memiliki densitas 0,8492 g/mL, pH 8, dan tampakan jernih. Parameter pH dan tampakan telah memenuhi SNI, sedangkan densitas dan kadar etanol masih memerlukan pemurnian lanjutan.

Kata Kunci: DES, delignifikasi, bioetanol, HCl, limbah kulit nanas

ABSTRACT

BIOETHANOL PRODUCTION FROM PINEAPPLE PEEL WASTE USING A DEEP EUTECTIC SOLVENT (DES) BASED DELIGNIFICATION PROCESS

(Helen Chairunisa, 2026, 72 *Pages*, 8 *Tables*, 8 *Figures*, 4 *Appendices*)

The increasing demand for energy and the depletion of fossil fuel reserves have encouraged the development of bioethanol as a renewable energy source. Pineapple peel waste is a lignocellulosic biomass with great potential as a feedstock for bioethanol production; however, its high lignin content inhibits the hydrolysis process. This study aimed to investigate the effect of delignification using a Deep Eutectic Solvent (DES) based on choline chloride (ChCl) and lactic acid, determine the optimum acid hydrolysis conditions using HCl concentrations of 3, 4, 5, 6, and 7 M with hydrolysis times of 60, 90, and 120 minutes, and evaluate the quality of the produced bioethanol based on SNI 7390:2008. The experimental stages included delignification, acid hydrolysis, fermentation using Saccharomyces cerevisiae, and distillation. The results showed that delignification reduced the lignin content from 23% to 7% and increased the cellulose content from 57% to 60%. The optimum condition was achieved using 6 M HCl for 90 minutes, producing a glucose content of 17.4 %Brix, a fermented ethanol content of 54%, and an ethanol content of 60.20% as determined by GC-MS analysis.The resulting bioethanol had a density of 0.8492 g/mL, a pH of 8, and a clear appearance. The pH and appearance met the SNI requirements, whereas the density and ethanol content still require further purification to obtain higher-purity bioethanol.

Keywords: DES*, delignification, bioethanol,* HCl*, pineapple peel waste.*