

## ABSTRAK

### PRODUKSI BIOETANOL DAR LIMBAH KULIT NANAS MELALUI *PRETREATMENT DEEP EUTECTIC SOLVENT* BERBASIS *GLYCINE/LACTIC ACID* DAN HIDROLISIS ASAM

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(Dea Dwi Puspita, 2026, 53 Halaman, 14 Tabel, 32 Gambar, 3 Lampiran)

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Penelitian ini bertujuan memproduksi bioetanol dari limbah kulit nanas melalui *pretreatment* delignifikasi *Deep Eutectic Solvent* (DES) berbasis *Glycine/Lactic Acid*, Hidrolisis asam sulfat ( $H_2SO_4$ ), dan Fermentasi menggunakan *Saccharomyces cerevisiae*. Variasi rasio molar DES yang diuji adalah 1:3, 1:5, 1:7, 1:9, dan 1:10. Hasil analisis Chesson-Datta menunjukkan rasio molar 1:7 paling efisien dengan *lignin removal* sebesar 68%, menurunkan kadar lignin dari 24% menjadi 7,6%, serta menghasilkan kandungan selulosa 48% dan hemiselulosa 24%. Kondisi optimum hidrolisis diperoleh pada konsentrasi  $H_2SO_4$  17% dengan waktu 90 menit, menghasilkan kadar glukosa tertinggi 17,4%. Pada fermentasi, kadar bioetanol tertinggi sebesar 48% dicapai pada hari ke-3, kemudian menurun akibat menipisnya substrat. Analisis GC-MS mengkonfirmasi etanol sebagai komponen dominan dengan luas area  $\pm 39\%$ . Meskipun belum memenuhi standar SNI 7390:2012 (min. 99,5%), penelitian ini membuktikan potensi kulit nanas sebagai bahan baku bioetanol melalui teknologi DES yang ramah lingkungan.

**Kata Kunci:** Bioetanol, *deep eutectic solvent*, delignifikasi, fermentasi, hidrolisis asam, kulit nanas, *saccharomyces cerevisiae*.

## ABSTRACT

### **BIOETHANOL PRODUCTION FROM PINEAPPLE PEEL WASTE THROUGH PRETREATMENT WITH GLYCINE/LACTIC ACID BASED DEEP EUTECTIC SOLVENT AND ACID HYDROLYSIS**

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(Dea Dwi Puspita, 2026, 53 Pages, 14 Tables, 32 Figures, 3 Appendices)

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*This study aimed to produce bioethanol from pineapple peel waste through delignification pretreatment using a Glycine/Lactic Acid-based Deep Eutectic Solvent (DES), sulfuric acid ( $H_2SO_4$ ) hydrolysis, and fermentation using *Saccharomyces cerevisiae*. DES molar ratios of 1:3, 1:5, 1:7, 1:9, and 1:10 were evaluated. Chesson-Datta analysis revealed that the 1:7 molar ratio was the most efficient, achieving 68% lignin removal, reducing lignin content from 24% to 7.6%, while retaining cellulose at 48% and hemicellulose at 24%. Optimum hydrolysis conditions were obtained at 17%  $H_2SO_4$  concentration with a 90-minute reaction time, yielding the highest glucose content of 17.4% Brix. During fermentation, the maximum bioethanol content of 48% was achieved on day 3, after which it declined due to substrate depletion. GC-MS analysis confirmed ethanol as the dominant compound with a peak area of  $\pm 39\%$ . Although the bioethanol content did not yet meet the SNI 7390:2012 standard (min. 99.5%), this study demonstrates the potential of pineapple peel waste as a bioethanol feedstock through an environmentally friendly DES-based technology.*

**Keywords:** Acid hydrolysis, bioethanol, deep eutectic solvent, delignification, fermentation, pineapple peel, *saccharomyces cerevisiae*.