

ABSTRAK

Analisis Rasio Bahan Baku dan Massa Ragi Pada Pembuatan Bioetanol Menggunakan Kulit Pisang dan Ampas Tebu.

(M. Nadhir Rafi, 2026, 49 Halaman, 5 Tabel, 2 Gambar, 4 Lampiran)

Penelitian ini dilatar belakangi oleh menipisnya cadangan bahan bakar fosil dan meningkatnya kebutuhan energi terbarukan, sehingga limbah biomassa seperti kulit pisang dan ampas tebu yang mengandung selulosa dan hemiselulosa tinggi berpotensi dikonversi menjadi bioetanol. Penelitian ini bertujuan menganalisis pengaruh variasi rasio bahan baku kulit pisang dan ampas tebu serta massa ragi terhadap kadar glukosa dan bioetanol, menentukan kondisi optimum fermentasi, serta memperoleh kadar bioetanol melalui analisis GC-MS. Metodologi penelitian terdiri atas preparasi bahan baku, delignifikasi menggunakan NaOH 2%, hidrolisis enzimatis dengan enzim selulase 1%, dan fermentasi menggunakan ragi *Saccharomyces cerevisiae* selama 4 hari dengan variasi rasio bahan baku (1:1, 1:2, dan 2:1) dan massa ragi (4%, 6%, 8%, 10%, dan 12%). Hasil penelitian menunjukkan kondisi optimum pada rasio bahan baku 1:2 dengan massa ragi 6% menghasilkan kadar glukosa tertinggi 17,8%, kadar bioetanol tertinggi 58%, indeks bias 1,3522 mendekati standar SNI (1,3633), dan analisis GC-MS menghasilkan kadar etanol 45,16%. Kesimpulan penelitian ini membuktikan bahwa limbah kulit pisang dan ampas tebu berpotensi dimanfaatkan sebagai bahan baku bioetanol dengan pengaturan rasio dan massa ragi yang optimal, sehingga berkontribusi pada pengembangan energi terbarukan berbasis limbah agroindustri serta solusi penanganan limbah pertanian yang inovatif dan bernilai ekonomi tinggi.

Kata Kunci: Ampas Tebu, bioetanol, enzim selulase, fermentasi, kulit pisang, dan *Saccharomyces cerevisiae*.

ABSTRACT

ANALYSIS OF THE RATIO OF RAW MATERIALS AND YEAST MASS IN BIOETHANOL PRODUCTION USING BANANA PEEL AND SUGARCANE BAGASSE.

(M. Nadhir Rafi, 2026, 49 Pages, 5 Tables, 2 Figures, 4 Attachments)

This research is motivated by the depletion of fossil fuel reserves and the increasing need for renewable energy, so that biomass waste such as banana peels and bagasse containing high cellulose and hemicellulose has the potential to be converted into bioethanol. This study aims to analyze the effect of variations in the ratio of banana peel and bagasse raw materials and yeast mass on glucose and bioethanol levels, determine the optimum fermentation conditions, and obtain bioethanol levels through GC-MS analysis. The research methodology consists of raw material preparation, delignification using 2% NaOH, enzymatic hydrolysis with 1% cellulase enzyme, and fermentation using *Saccharomyces cerevisiae* yeast for 4 days with variations in the raw material ratio (1:1, 1:2, and 2:1) and yeast mass (4%, 6%, 8%, 10%, and 12%). The results of the study showed that the optimum conditions at a raw material ratio of 1:2 with a yeast mass of 6% produced the highest glucose content of 17.8%, the highest bioethanol content of 58%, a refractive index of 1.3522 approaching the SNI standard (1.3633), and GC-MS analysis produced an ethanol content of 45.16%. The conclusion of this study proves that banana peel and bagasse waste have the potential to be used as raw materials for bioethanol by setting the optimal ratio and yeast mass, thus contributing to the development of renewable energy based on agro-industrial waste as well as innovative and high-value agricultural waste management solutions.

Keywords: *Sugarcane bagasse, bioethanol, cellulase enzymes, fermentation, banana peels, and Saccharomyces cerevisiae.*