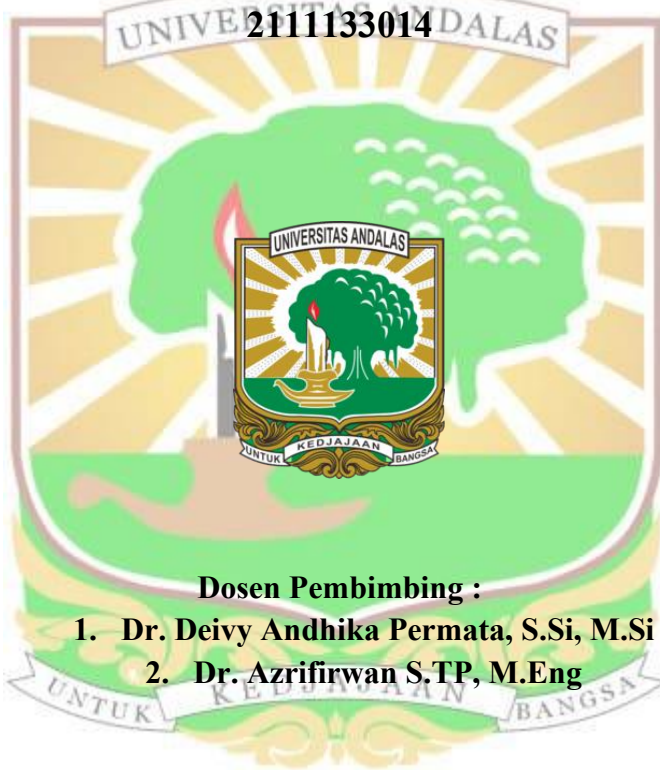


OPTIMASI BLEACHING TANDAN KOSONG KELAPA SAWIT MENGGUNAKAN VARIASI ALKALI PEROKSIDA DAN SUHU PROSES

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ABSTRAK

Tandan Kosong Kelapa Sawit (TKKS) merupakan limbah lignoselulosa dengan potensi tinggi sebagai bahan baku selulosa, namun kandungan lignin yang tinggi menjadi kendala dalam proses pemurnian. Penelitian ini bertujuan untuk menganalisis pengaruh konsentrasi alkali peroksida dan suhu *bleaching* serta menentukan konsentrasi dan suhu yang optimal terhadap karakteristik serat TKKS, meliputi rendemen, kadar air, kadar abu, derajat putih, dan bilangan kappa. Penelitian ini menggunakan metode *Response Surface Methodology* (RSM) dengan *Central Composite Design* (CCD), mencakup variasi konsentrasi NaOH (1,6–18,4%), H₂O₂ (21,5–38,4%), dan suhu *bleaching* (73–106 °C). Hasil menunjukkan bahwa suhu *bleaching* memiliki pengaruh dominan terhadap penurunan kadar air, sedangkan peningkatan konsentrasi NaOH dan H₂O₂ berkontribusi pada peningkatan derajat putih dan penurunan bilangan kappa. RSM memberikan solusi kombinasi optimum pada konsentrasi NaOH 9,4%, H₂O₂ 31,5%, dan suhu 86,2 °C, dengan desirabilitas sebesar 0,789, menghasilkan rendemen 63,7%, kadar air 3,19%, kadar abu 0,51%, derajat putih 52,87%, dan bilangan kappa 19,08. Optimasi ini menunjukkan efektivitas pendekatan RSM dalam menentukan kondisi proses *bleaching* yang efisien untuk memperoleh kualitas pulp TKKS yang lebih baik.

Kata Kunci: *Bleaching*, H₂O₂, NaOH, RSM, TKKS.

OPTIMIZATION OF OIL PALM EMPTY FRUIT BUNCH BLEACHING USING VARYING ALKALINE PEROXIDE CONCENTRATIONS AND PROCESSING TEMPERATURES

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ABSTRACT

Oil Palm Empty Fruit Bunches (OPEFB) are lignocellulosic waste with high potential as a cellulose raw material; however, their high lignin content poses a major challenge in the purification process. This study aims to analyze the effects of alkaline peroxide concentration and bleaching temperature, as well as to determine the optimal concentration and temperature conditions on the characteristics of OPEFB fibers, including yield, moisture content, ash content, brightness, and kappa number. The study employed Response Surface Methodology (RSM) with a Central Composite Design (CCD), incorporating variations in NaOH concentration (1.6–18.4%), H₂O₂ concentration (21.5–38.4%), and bleaching temperature (73–106 °C). The results showed that bleaching temperature had a dominant effect on reducing moisture content, while increasing concentrations of NaOH and H₂O₂ contributed to higher brightness and lower kappa number. The RSM optimization yielded an optimal condition at 9.4% NaOH, 31.5% H₂O₂, and 86.2 °C, with a desirability value of 0.789. Under these conditions, the process produced a pulp yield of 63.7%, moisture content of 3.19%, ash content of 0.51%, brightness of 52.87%, and a kappa number of 19.08. These findings demonstrate the effectiveness of RSM in optimizing the bleaching process to produce higher-quality OPEFB pulp.

Keywords: *Bleaching, H₂O₂, NaOH, RSM, OPEFB.*