ABSTRACT

DESIGN OF A RAPID DETECTION TOOL FOR PALM OIL FREE FATTY ACID CONTENT USING A PH METER AND TURBIDITY METER

By

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High levels of Free Fatty Acid (ALB) in CPO can be very detrimental because it can cause a decrease in yield. The objectives of this study are to design a portable tool for rapid detection of Free Fatty Acid (ALB) content, analyze the relationship between pH and turbidity contained in CPO with Free Fatty Acid content and build an Artificial Neural Network Architecture to predict the FFA content of CPO and analyze the ease of use and attractiveness of a portable tool for rapid detection of FFA content. This research method is a backpropagation type artificial neural network. The rapid detection of free fatty acid content has been successfully designed with the main components of the Arduino Uno microcontroller, Potentiometer, LCD, and I2C. The components are put into a box that has a size of 18.5 cm x 6.5 cm x 11.5 cm. The artificial neural network development process produces the best prediction with logsig-tansig-tansig activation function. The RMSE value and the coefficient of determination (R^2) of the training results of the Artificial Neural Network (JST) model are 0.9571 and 0.8447 or 84.47%, while in testing the JST model the RMSE and R^2 values obtained are 0.5892 and 0.9541 or 95.41%. Training results and test results produce logsig-tansig-tansig as the best activation function.

Keywords: *Crude Palm Oil (CPO), Free Fatty Acid, Artificial Neural Network.*

ABSTRACT

RANCANG BANGUN ALAT DETEKSI CEPAT KANDUNGAN ASAM LEMAK BEBAS KELAPA SAWIT MENGGUNAKAN PH METER DAN *TURBIDITY* METER

Oleh

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Kadar Asam Lemak Bebas (ALB) yang tinggi pada CPO bisa sangat merugikan karena dapat menyebabkan penurunan rendemen. Tujuan penelitian ini adalah Merancang alat portabel deteksi cepat kandungan Asam Lemak Bebas (ALB), Menganalisis hubungan pH dan *turbidity* yang terkandung di dalam CPO dengan kandungan ALB. Metode penelitian ini yaitu jaringan saraf tiruan tipe *backpropagation*. Alat deteksi cepat kadar asam lemak bebas telah berhasil dirancang dengan komponen utama yaitu mikrokontroler *Arduino Uno*, Potensiometer, LCD, dan I2C. Komponen-komponen tersebut dimasukkan ke dalam kotak yang memiliki ukuran 18,5 cm x 6,5 cm x 11.5 cm. Proses pengembangan jaringan saraf tiruan menghasikan prediksi terbaik dengan fungsi aktivasi *logsig-tansig-tansig*. Nilai RMSE dan nilai koefisien determinasi (R^2) dari hasil pelatihan model JaringanSaraf Tiruan (JST) ialah 0,9571 dan 0,8447 atau sebesar 84,47%, sedangkan pada pengujian model JST nilai RMSE dan R^2 yang diperoleh sebesar 0,5892 dan 0,9541 atau sebesar 95,41%. Hasil pelatihan dan hasil pengujian menghasilkan *logsig-tansig-tansig* sebagai fungsi aktivasi terbaik.

Kata kunci : *Crude Palm Oil*, Asam Lemak Bebas, Jaringan Saraf Tiruan