

**NAFIS SULTHAN INGGIL** NPM. 200331100071. **Analisis *Non-Destructive* Aktivitas Antioksidan dan Kadar Piperin Cabe Jamu Menggunakan Kombinasi *Fourier Transform Infra Red* dan Pemodelan Regresi.** Dibawah bimbingan **Dr. Mohammad Fuad F M. S. TP, M.Si., dan Cahyo Indarto, STP. MP. Ph.D.**

---

## **ABSTRAK**

Analisis senyawa kimia secara *non-destructive* memiliki kelebihan yaitu cepat, murah dan ramah lingkungan. Metode *non-destructive* saat ini banyak dikembangkan untuk memprediksi kandungan senyawa aktif bahan herbal, seperti cabe jamu. Penelitian ini bertujuan untuk menganalisis performansi model prediksi aktivitas antioksidan dan kandungan piperin cabe jamu secara *non-destructive* kombinasi *Fourier Transform Infra Red* dan pemodelan regresi. Sampel yang digunakan dalam penelitian ini ialah cabe jamu dengan kadar air yang bervariasi karena absorbansi data FTIR sensitif terhadap kadar air. Pengujian menggunakan FTIR menghasilkan data spektra yang akan digunakan sebagai variabel prediktor. Cabe jamu juga dilakukan pengujian aktivitas antioksidan menggunakan metode DPPH dan kadar piperin menggunakan metode *Gas Chromatography-Mass Spectrometry* (GC-MS), hasil pengujian aktivitas dan kadar piperin digunakan sebagai variabel respon. Selanjutnya dilakukan *pre-treatment* data spektra menggunakan *pre-treatment raw data*, *Multiplicative Scattered Correction* (MSC), *de-trending*, *standart normal variate* (SNV), dan *normalize* dilanjut pemodelan regresi *multiple Linear Regression* (MLR) dan Metode *support vector machine regression* (SVMR) untuk membentuk model prediksi aktivitas antioksidan dan kadar piperin. Hasil penelitian menunjukkan bahwa performansi model prediksi SVMR *pre-treatment* MSC pada aktivitas antioksidan dan kadar piperin termasuk model prediksi yang lebih baik, karena menghasilkan nilai  $R^2$  yang lebih tinggi dan RMSE yang lebih rendah. Nilai yang diperoleh pada sampel aktivitas antioksidan (RMSE = 37,0222 dan  $R^2 = 0,9373$ ) dengan hasil prediksi H0\_2 = 235,9653; H0\_3 = 237,8827; H0\_2 dan H0\_3 = 236,132; H2\_2 = 395,0502; H2\_3 = 433,0424; H2\_2 dan H2\_3 = 416,3371; H3\_2 = 426,4641. Sedangkan sampel kadar piperin ( $R^2 = 0,9739$  dan RMSE = 0,0082) dengan hasil prediksi H0\_2 = 0,021526; H0\_3 = 0,023877; H0\_2 dan H0\_3 = 0,02227; H2\_2 = 0,067065; H2\_3 = 0,080215; H2\_2 dan H2\_3 = 0,073691; H3\_2 dan 0,102549.

**Kata kunci:** Cabe Jamu, *Fourier Transform Infra Red*, MLR, *Non-destructive*, SVMR

**NAFIS SULTHAN INGGIL** NPM. 200331100071. **Analisis Non-Destructive Aktivitas Antioksidan dan Kadar Piperin Cabe Jamu Menggunakan Kombinasi *Fourier Transform Infra Red* dan Pemodelan Regresi.** Dibawah bimbingan **Dr. Mohammad Fuad F M. S. TP, M.Si., dan Cahyo Indarto, STP. MP. Ph.D.**

---

### **ABSTRACT**

*Non-destructive analysis of chemical compounds has the advantages of being fast, cheap and environmentally friendly. Non-destructive methods are currently being developed to predict the active compound content of herbal ingredients, such as herbal chilies. This research aims to analyze the performance of the prediction model for antioxidant activity and piperine content of herbal chilies using a non-destructive combination of Fourier Transform Infrared and regression modeling. The samples used in this research were herbal chilies with varying water content because the absorbance of FTIR data is sensitive to water content. Testing using FTIR produces spectral data that will be used as a predictor variable. Herbal chilies were also tested for antioxidant activity using the DPPH method and piperine levels using the Gas Chromatography-Mass Spectrometry (GC-MS) method. The results of activity testing and piperine levels were used as response variables. Next, pre-treatment of the spectra data was carried out using raw data pre-treatment, Multiplicative Scattered Correction (MSC), de-trending, standard normal variable (SNV), and normalization followed by multiple linear regression (MLR) modeling and the support vector machine regression method ( SVMR) to form a prediction model for antioxidant activity and piperine levels. The results showed that the performance of the SVMR prediction model for pre-treatment MSC on antioxidant activity and piperine levels was a better prediction model, because it produced higher R<sup>2</sup> values and lower RMSE. The values obtained for the antioxidant activity samples (RMSE = 37.0222 and R<sup>2</sup> = 0.9373) with predicted results H0\_2 = 235.9653; H0\_3 = 237.8827; H0\_2 and H0\_3 = 236.132; H2\_2 = 395.0502; H2\_3 = 433.0424; H2\_2 and H2\_3 = 416.3371; H3\_2 = 426.4641. Meanwhile, the sample piperine levels (R<sup>2</sup> = 0.9739 and RMSE = 0.0082) with predicted results H0\_2 = 0.021526; H0\_3 = 0.023877; H0\_2 and H0\_3 = 0.02227; H2\_2 = 0.067065; H2\_3 = 0.080215; H2\_2 and H2\_3 = 0.073691; H3\_2 and 0.102549.*

**Keywords:** *Jamu Chili, Fourier Transform Infra Red, MLR, Non-destructive, SVMR*