

**PENENTUAN KONDISI OPTIMUM EKSTRAKSI SENYAWA
ANTIOKSIDAN DAN FENOLIK TOTAL DARI DAUN KAKAO (*Theobroma
cacao* L) MENGGUNAKAN *RESPONSE SURFACE METHODOLOGY*
(RSM)**

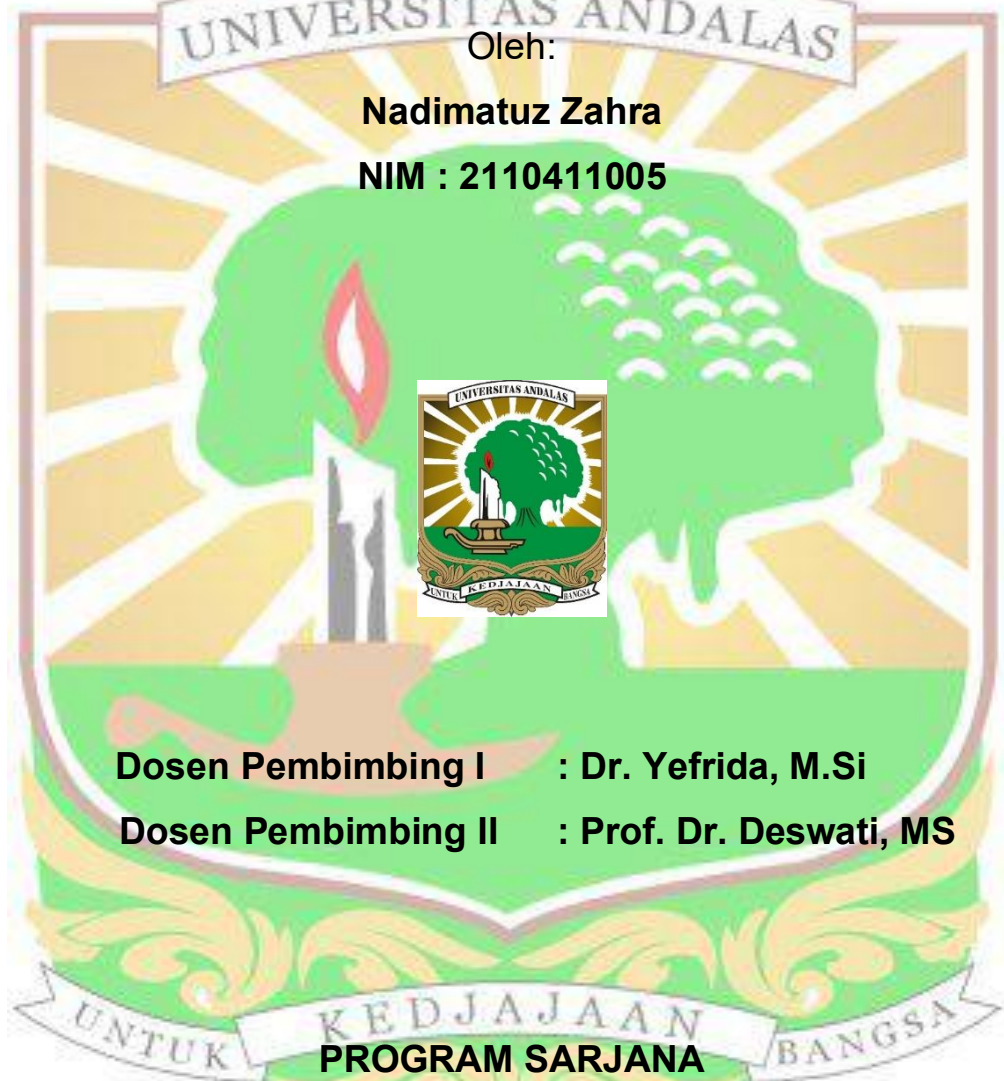
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INTISARI

PENENTUAN KONDISI OPTIMUM EKSTRAKSI SENYAWA ANTIOKSIDAN DAN FENOLIK TOTAL DARI DAUN KAKAO (*Theobroma cacao* L) MENGGUNAKAN *RESPONSE SURFACE METHODOLOGY* (RSM)

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Daun kakao (*Theobroma cacao* L.) merupakan sumber senyawa fenolik yang berharga dengan sifat antioksidan yang kuat. Penelitian ini berfokus pada penentuan kondisi optimum ekstraksi senyawa antioksidan dan kandungan fenolik total dari daun kakao menggunakan *Response Surface Methodology* (RSM) dengan *Central Composite Design* (CCD). Kondisi ekstraksi meliputi suhu ekstraksi, waktu ekstraksi dan rasio sampel terhadap pelarut dievaluasi untuk melihat pengaruhnya terhadap kapasitas antioksidan dan kandungan fenolik total. Penentuan kapasitas antioksidan dilakukan dengan metode DPPH (2,2-diphenyl-1-picrylhydrazyl), sedangkan penentuan kandungan fenolik total dilakukan dengan metode Folin-Ciocalteu. Respon dianalisis menggunakan polinomial orde kedua. Hasil analisis kapasitas antioksidan menunjukkan nilai koefisien determinasi (R^2) = 0,9545 dan *Adjusted R*² = 0,9091. Kandungan fenolik total menunjukkan nilai koefisien determinasi (R^2) = 0,9513 dan *Adjusted R*² = 0,9026. Nilai R^2 dan *Adjusted R*² kedua respon mengindikasikan bahwa model mampu menjelaskan variasi respon dengan baik. Analisis varians (ANOVA) model kuadratik signifikan terhadap respon dengan nilai *p-value* < 0,0001 serta nilai *Lack of Fit* (LOF) yang tidak signifikan menunjukkan bahwa model memiliki kesesuaian yang baik terhadap data eksperimen sehingga layak digunakan untuk optimasi. Model kuadratik RSM menentukan kondisi ekstraksi optimum pada suhu reaksi 80°C, waktu reaksi 32 menit dan rasio sampel terhadap pelarut 1:25 g/mL. Kapasitas antioksidan maksimum eksperimen diperoleh 7,8967 mg AAE/g FW dan kapasitas fenolik total 16,0855 mg GAE/g FW. Hasil menunjukkan bahwa RSM efektif digunakan untuk penentuan kondisi optimum ekstraksi antioksidan dan fenolik total dari daun kakao.

Kata kunci: Daun *Theobroma cacao* L., Kapasitas antioksidan, Kandungan fenolik total, RSM

ABSTRACT

DETERMINATION OF OPTIMAL CONDITIONS FOR THE EXTRACTION OF ANTIOXIDANTS AND TOTAL PHENOLIC COMPOUNDS FROM COCOA LEAVES (*Theobroma cacao* L) USING THE RESPONSE SURFACE METHOD (RSM)

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Cocoa leaves (*Theobroma cacao* L.) are a valuable source of phenolic compounds with strong antioxidant properties. This study focused on determining the optimal extraction conditions for antioxidant compounds and total phenolic content from cocoa leaves using Response Surface Methodology (RSM) with a Central Composite Design (CCD). Extraction conditions, including extraction temperature, extraction time, and the sample-to-solvent ratio, were evaluated to determine their effects on antioxidant capacity and total phenolic content. Antioxidant capacity was determined using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method, while total phenolic content was determined using the Folin-Ciocalteu method. The responses were analyzed using second-order polynomials. The results of the antioxidant capacity analysis showed a coefficient of determination (R^2) of 0.9545 and an adjusted R^2 of 0.9091. The total phenolic content analysis showed a coefficient of determination (R^2) of 0.9513 and an adjusted R^2 of 0.9026. The R^2 and Adjusted R^2 values for both responses indicate that the model is capable of explaining the variation in the responses well. Analysis of variance (ANOVA) of the quadratic model was significant for the response with a p-value < 0.0001 , and the non-significant Lack of Fit (LOF) value indicates that the model fits the experimental data well and is therefore suitable for optimization. The RSM quadratic model determined the optimal extraction conditions to be a reaction temperature of 80°C, a reaction time of 32 minutes, and a sample-to-solvent ratio of 1:25 g/mL. The maximum antioxidant capacity obtained in the experiment was 7.8967 mg AAE/g FW, and the total phenolic capacity was 16.0855 mg GAE/g FW. The results indicate that RSM is effective for determining the optimal conditions for the extraction of antioxidants and total phenolics from cocoa leaves.

Keywords: *Theobroma cacao* L. leaves, antioxidant capacity, total phenolic content, RSM