OPTIMASI EKSTRAKSI ULTRASONIK TERHADAP SENYAWA AKTIF DAN AKTIVITAS ANTIOKSIDAN DAUN PARIJOTO (*Medinilla speciosa* Blume) DENGAN *BOX-BEHNKEN DESIGN*

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ABSTRAK

Keanekaragaman tanaman di Indonesia memiliki potensi besar sebagai sumber daya alternatif penunjang kesehatan. Daun parijoto (*Medinilla speciosa* Blume) merupakan tanaman budidaya Indonesia yang mengandung berbagai metabolit sekunder, terutama senyawa fenolik dan flavonoid yang berpotensi memberikan aktivitas antioksidan. Metode *Ultrasound-Assisted Extraction* (UAE) memiliki kemampuan meningkatkan efisiensi ekstraksi senyawa bioaktif seperti antioksidan melalui efek kavitasi, sehingga mempercepat perpindahan massa dan mengurangi waktu ekstraksi. Efektivitas UAE sangat dipengaruhi oleh parameter proses seperti suhu, waktu, dan konsentrasi pelarut. Oleh karena itu, optimasi kondisi ekstraksi menggunakan *Box–Behnken Design* (BBD) dilakukan untuk memperoleh kombinasi parameter yang menghasilkan kadar fenol (TPC), flavonoid (TFC), dan aktivitas antioksidan optimal secara efisien dan terkontrol. Analisis model menunjukkan bahwa respon TPC dapat dimodelkan secara signifikan dengan model kuadratik, sedangkan TFC dimodelkan dengan model 2FI dan aktivitas antioksidan FRAP dinyatakan sebagai model *mean*. Hasil optimasi simultan menunjukkan kondisi ekstraksi optimal pada suhu 53–53,2°C, waktu 60 menit, dan konsentrasi pelarut 96% dengan nilai desirability 0,834. Validasi model menunjukkan bahwa nilai aktual berada dalam interval prediksi 95%, sehingga model memiliki kemampuan prediktif yang dapat diterima.

Kata Kunci: *Box–Behnken Design, Fenol, Flavonoid, FRAP, Parijoto*

OPTIMIZATION OF ULTRASONIC EXTRACTION OF ACTIVE COMPOUNDS AND ANTIOXIDANT ACTIVITY OF PARIJOTO LEAVES (*Medinilla speciosa* Blume) WITH BOX-BEHNKEN DESIGN

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ABSTRACT

The diversity of plants in Indonesia has great potential as an alternative resource to support health. Parijoto leaves (Medinilla speciosa Blume) are an Indonesian cultivated plant that contains various secondary metabolites, especially phenolic compounds and flavonoids that have the potential to provide antioxidant activity. The Ultrasound-Assisted Extraction (UAE) method has the ability to increase the efficiency of extracting bioactive compounds such as antioxidants through the cavitation effect, thereby accelerating mass transfer and reducing extraction time. The effectiveness of UAE is greatly influenced by process parameters such as temperature, time, and solvent concentration. Therefore, extraction condition optimization using Box–Behnken Design (BBD) was performed to obtain a combination of parameters that produced optimal phenol (TPC), flavonoid (TFC), and antioxidant activity levels in an efficient and controlled manner. Model analysis showed that the TPC response could be significantly modeled using a quadratic model, while TFC was modeled using a 2FI model and FRAP antioxidant activity was expressed as a mean model. Simultaneous optimization results showed optimal extraction conditions at a temperature of 53–53.2°C, a time of 60 minutes, and a solvent concentration of 96% with a desirability value of 0.834. Model validation showed that the actual values were within the 95% prediction interval, indicating that the model had acceptable predictive capabilities.

Keyword: Box–Behnken Design, Flavonoid, FRAP, Phenol, Parijoto