OPTIMASI PROSES EKSTRAKSI METANOL KULIT BATANG TANAMAN KAYU PUTIH (*Melaleuca cajuputi* Powell) MENGGUNAKAN *RESPONSE SURFACE METHODOLOGY*

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INTISARI

Kulit batang pada tegakan kayu putih merupakan sisa bagian tanaman yang belum tereksplorasi. Pemanfaatan bagian kulit batang kayu putih belum banyak dilakukan karena nilai ekonomi yang rendah dan penggunaannya sebagai sumber energi panas. Analisis komponen kimia dan komponen ekstraktif dengan metode ekstraksi sederhana berpotensi meningkatkan ragam pemanfaatan kulit batang kayu putih. Untuk meningkatkan hasil ekstraksi kulit batang kayu putih dapat dilakukan optimasi proses ekstraksi menggunakan metode permukaan respon (RSM). Penelitian ini bertujuan untuk mengoptimasi proses ekstraksi kulit batang kayu putih menggunakan RSM untuk mendapatkan kondisi optimum komponen ekstraktif dan aktivitas antioksidan.

Kulit batang kayu putih umur 26 tahun didapatkan dari tegakan kayu putih berlokasi di Paliyan, Gunungkidul. Serbuk kulit batang kayu putih diekstraksi menggunakan metode ekstraksi sederhana *waterbath* berdasarkan kondisi ekstraksi rancangan Box-Behnken (BBD) dari tiga faktor yaitu suhu ekstraksi (60, 80, dan 100^{o}C), waktu ekstraksi (60, 120, dan 180 menit), dan konsentrasi metanol (40, 60, dan 80%). Proses optimasi RSM dilakukan dengan penentuan kondisi optimum dari nilai prediksi model yang direkonstruksi dari parameter kadar ekstraktif (KE), kadar fenolat total (KFT), kadar flavonoid total (KVT) dan persen inhibisi aktivitas antioksidan (IAA). Data sekunder holoselulosa diuji dengan metode klorit asam dan identifikasi komponen kimia dengan injeksi GC-MS metode TMCS derivatif.

Hasil pengujian holoselulosa kulit batang kayu putih sebesar 76,65%. Hasil injeksi GC-MS menunjukkan ekstrak metanol kulit kayu putih tersusun atas komponen gula (*erythritol, D-arabinose, D-lyxose, adonitol, d-galactose, D-glucitol,* dan *L-rhamnose*), komponen asam lemak (*lactic acid, boric acid, glycerol, glyceric acid, malic acid,* dan *palmitic acid*), dan beberapa komponen fenolat sederhana (*gallic acid* dan *protocatechuic acid).* Analisis varian menjelaskan faktor yang paling berpengaruh dalam optimasi proses ekstraksi kulit batang kayu putih adalah konsentrasi metanol. Model matematika untuk memprediksi parameter respon KE, KFT, KVT, dan IAA dikembangkan dengan R^2 masing-masing secara berurutan sebesar 0,98, 0,96, 0,92 dan 0,89 dengan nilai *lack-of-fit* tidak signifikan ($p>0,05$) untuk seluruh model. Hasil optimasi berupa kondisi optimum proses ekstraksi metanol kulit kayu putih yang didapatkan pada suhu ekstraksi 96,77^{o}C, waktu ekstraksi 163,03 menit, dan konsentrasi pelarut metanol 64,24% dengan nilai KE sebesar 3,48%, KFT sebesar 57,41 mg GAE/g, KVT sebesar 150,99 mg QE/g, dan IAA sebesar 41,88%.

Kata kunci: kulit, kayu putih, optimasi, RSM, skrining fitokimia

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OPTIMIZATION OF CAJUPUT BARK (*Melaleuca cajuputi* Powell) METHANOL EXTRACTION PROCESS USING RESPONSE SURFACE METHODOLOGY

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ABSTRACT

The stem bark of cajuput stands is the residual part of the plant that has not been widely explored. The utilization of cajuput bark has not been carried out because of its low economic value and mostly use as thermal energy. Analysis of chemical and extractive components using a simple extraction method had the potential to increase the variety of cajuput bark utilization. To increase the extraction output of cajuput bark, the extraction process was optimized using response surface methodology (RSM). This study aims to optimize the extraction process of cajuput bark using RSM to obtain optimum conditions for extractive compounds and antioxidant activity.

The cajuput bark was obtained from 26-year-old cajuput stands located in Paliyan, Gunungkidul. The cajuput bark powder was extracted using simple waterbath extraction method based on the Box-Behnken (BBD) extraction conditions with three factors whose extraction temperature (60, 80, and 100^{o}C), extraction time (60, 120, and 180 minutes), and methanol concentration (40, 60, and 80%). The RSM optimization process is carried out by determined the optimum conditions of the predicted values from the reconstructed model of extractive content (EC), total phenolic content (TPC), total flavonoid content (TFC) and percentage inhbition of antioxidant activity (IAA). Holocellulose content was deterniend by acid chlorite method and identification of chemical components carried out by GC-MS injection with TMCS derivative method.

The holocellulose content of cajuput bark were 76.65%. The GC-MS results showed that the chemical components identified in cajuput bark methanol extract were sugar components (erythritol, D-arabinose, D-lyxose, adonitol, d-galactose, D-glucitol, and L-rhamnose), fatty acid components (lactic acid, boric acid, glycerol, glyceric acid, malic acid, and palmitic acid), and several simple phenolic compounds (gallic acid and protocatechuic acid). Analysis of variance explained that the most influential factor in optimizing the cajuput bark extraction process was methanol concentration. A mathematical model to predict the results of EC, TPC, TFC, and AA was developed with R^2 respectively of 0.98, 0.96, 0.92 and 0.89 with an insignificant lack-of-fit value ($p>0.05$) for the entire models. The optimum conditions for the cajuput bark methanol extraction process were obtained at extraction temperature of 96.77^{o}C, extraction time of 163.03 minutes, and methanol concentration of 64.24% with a EC value of 3.48%, TPC of 57.41 mg GAE/g, TFC of 150.99 mg QE/g and IAA of 41.88%.

keyword: bark, cajuput, optimization, RSM, phytochemical screening

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