

**OPTIMASI EKSTRAKSI PEKTIN DARI KULIT ARI
KEDELAI MENGGUNAKAN *MICROWAVE-ASSISTED
EXTRACTION* (MAE) DENGAN ASAM SITRAT**



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OPTIMASI EKSTRAKSI PEKTIN DARI KULIT ARI KEDELAI MENGGUNAKAN *MICROWAVE- ASSISTED EXTRACTION* (MAE) DENGAN ASAM SITRAT

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ABSTRAK

Kulit ari kedelai merupakan limbah agroindustri yang berpotensi dimanfaatkan sebagai sumber pektin alternatif. Penelitian ini bertujuan mengetahui pengaruh variasi derajat keasaman larutan asam sitrat dan waktu iradiasi pada proses ekstraksi menggunakan *Microwave-Assisted Extraction* (MAE) terhadap karakteristik pektin, serta menentukan kondisi optimum ekstraksi. Optimasi dilakukan menggunakan *Response Surface Methodology* (RSM) dengan rancangan *Central Composite Design* (CCD) yang melibatkan dua faktor, yaitu derajat keasaman (pH 1, 2, dan 3) serta waktu iradiasi (4, 6, dan 8 menit). Respon yang diamati meliputi rendemen, berat ekuivalen, kadar metoksil, kadar asam galakturonat, dan derajat esterifikasi. Hasil penelitian menunjukkan bahwa waktu iradiasi memberikan pengaruh yang lebih dominan dibandingkan derajat keasaman terhadap sebagian besar karakteristik pektin. Kondisi optimum diperoleh pada waktu iradiasi 8 menit dan pH 2,20 dengan nilai *desirability* 0,731, menghasilkan rendemen 17,53%, berat ekuivalen 757,79 mg/eq, kadar metoksil 2,84%, kadar asam galakturonat 85,89%, dan derajat esterifikasi 40,68%. Hasil verifikasi menunjukkan nilai aktual yang mendekati prediksi model, sedangkan analisis *Fourier Transform Infrared Spectroscopy* (FTIR) mengonfirmasi keberadaan gugus fungsi khas pektin. Dengan demikian, metode MAE menggunakan pelarut asam sitrat efektif untuk menghasilkan pektin berkualitas dari kulit ari kedelai.

Kata kunci : Asam Sitrat; Kulit Ari Kedelai; *Microwave-Assisted Extraction*; Pektin; *Response Surface Methodology*.

Optimization of Pectin Extraction from Soybean Hull Using Microwave-Assisted Extraction (MAE) with Citric Acid

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ABSTRACT

Soybean hull is an agro-industrial by-product with considerable potential as an alternative source of pectin. This study aimed to evaluate the effects of citric acid solution pH and irradiation time during Microwave-Assisted Extraction (MAE) on the characteristics of the extracted pectin and to determine the optimum extraction conditions. Optimization was carried out using Response Surface Methodology (RSM) based on a Central Composite Design (CCD) involving two factors, namely citric acid solution pH (1, 2, and 3) and irradiation time (4, 6, and 8 min). The responses evaluated were pectin yield, equivalent weight, methoxyl content, galacturonic acid content, and degree of esterification. The results showed that irradiation time had a more pronounced effect than solution pH on most pectin characteristics. The optimum extraction condition was achieved at an irradiation time of 8 min and pH 2.20, with a desirability value of 0.731, producing a pectin yield of 17.53%, an equivalent weight of 757.79 mg/eq, a methoxyl content of 2.84%, a galacturonic acid content of 85.89%, and a degree of esterification of 40.68%. Verification experiments demonstrated that the experimental values were in close agreement with the model predictions, while Fourier Transform Infrared Spectroscopy (FTIR) analysis confirmed the presence of the characteristic functional groups of pectin. Therefore, MAE using citric acid as the extraction solvent is an effective method for producing high-quality pectin from soybean hulls.

Keywords: Citric Acid; Microwave-Assisted Extraction; Pectin; Response Surface Methodology; Soybean Hull