

**OPTIMASI EKSTRAK BUAH ANDALIMAN (*Zanthoxylum  
acanthopodium* DC) DENGAN *RESPONSE SURFACE  
METHODOLOGY* TERHADAP KADAR FLAVONOID  
TOTAL DAN AKTIVITAS INHIBISI ENZIM  
ASETILKOLINESTERASE**

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**Abstrak**

Alzheimer merupakan penyakit neurodegeneratif dengan penurunan fungsi kognitif dan non-kognitif pada penderita. Patogenesis penyakit alzheimer diduga karena penurunan kadar asetilkolin dalam otak sehingga salah satu pendekatan terapeutik dalam memperlambat perkembangannya adalah melalui penghambatan asetilkolinesterase (AChE). Andaliman (*Z. acanthopodium*) berpotensi memiliki aktivitas inhibisi AChE karena kandungan flavonoid dalam buahnya. Penelitian ini mempelajari optimasi ekstraksi buah andaliman dengan faktor pengaruh daya gelombang mikro (270–630 W) dan lama waktu ekstraksi (10–30 detik) menggunakan *Central Composite Design* melalui program *Design Expert* 13.0. Dari ekstrak yang telah dioptimasi, diteliti kandungan flavonoid total dengan metode kolorimetri ( $\text{AlCl}_3$ ) serta aktivitas inhibisi asetilkolinesterase menggunakan metode Ellman. Daya gelombang mikro menunjukkan hasil  $p\text{-value} < 0,05$  sedangkan waktu ekstraksi menunjukkan hasil  $p\text{-value} > 0,05$ . Kondisi optimum diperoleh dengan nilai *desirability* 0,987 untuk mengekstraksi buah andaliman menggunakan pelarut etanol 70%, yaitu pada daya gelombang mikro 450 Watt dan waktu 10 detik yang dapat menghasilkan KFT sebesar 70,5923 mg QE/g ekstrak dan aktivitas inhibisi sebesar 35,098% pada konsentrasi 2 mg/ml ekstrak. Metode tersebut kemudian diverifikasi dan dianalisis berdasarkan *Residual Standard Error* yang menghasilkan nilai  $< 5\%$ . Hasil tersebut menunjukkan bahwa *Central Composite Design* dapat mengoptimalkan senyawa flavonoid dengan aktivitas inhibisi AChE dari buah *Z. acanthopodium*.

**Kata kunci:** Kadar Flavonoid Total, Metode Permukaan Respon, Penghambat Asetilkolinesterase, *Zanthoxylum acanthopodium*

**OPTIMIZATION OF ANDALIMAN FRUIT EXTRACT  
(*Zanthoxylum acanthopodium* DC) USING RESPONSE  
SURFACE METHODOLOGY ON TOTAL FLAVONOID  
CONTENT AND ACETYLCHOLINESTERASE  
ENZYME INHIBITION ACTIVITY**

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**Abstract**

Alzheimer's is a neurodegenerative disease with decreased cognitive and non-cognitive functions in patients. The pathogenesis of Alzheimer's disease is thought to be due to a decrease in acetylcholine levels in the brain, so one therapeutic approach to slowing its progress is through the inhibition of acetylcholinesterase (AChE). Andaliman (*Z. acanthopodium*) has the potential to exhibit AChE inhibitory activity due to the flavonoid content in the fruit. This paper studied the optimization of andaliman fruit extraction with the influence factor of microwave power (270–630 W) and extraction time duration (10–30 s) using a Central Composite Design through the Design Expert 13.0 program. From the optimized extract, the total flavonoid content (TFC) was studied using the colorimetric method (AlCl<sub>3</sub>) and the acetylcholinesterase inhibitory activity using the Ellman method. Microwave power results in a p-value <0.05, while extraction time results in a p-value >0.05. Optimum conditions were obtained with a desirability value of 0.987 for extracting andaliman fruit using 70% ethanol solvent, determined at 450 W microwave power and 10 s extraction time which resulted a TFC of 70,5923 mg QE/g extract and an inhibitory activity of 35,098% at a concentration of 2 mg/ml extract. The method was verified and analyzed based on residual standard error which resulted in a value <5%. These results indicate that the central composite design can optimize flavonoid compounds with AChE inhibitory activity from *Z. acanthopodium* fruit.

**Key words:** Acetylcholinesterase Inhibitor, Response Surface Methodology, Total Flavonoid Content, *Zanthoxylum acanthopodium*