

SKRIPSI SARJANA FARMASI

**PEMBENTUKAN DAN KARAKTERISASI NANOSUSPENSI EKSTRAK ETANOL
KENCUR (*Kaempferia galanga* L.) MENGGUNAKAN METODE ANTISOLVENT
PRECIPITATION**



Oleh:

NAVISA DESSAFITRI

NIM : 2211011028

Dosen Pembimbing:

apt. Adhitya Jessica, S.Farm., M.Si

Prof. Dr. apt. Erizal Zaini, M.Si

**FAKULTAS FARMASI
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ABSTRAK
Pembentukan Dan Karakterisasi Nanosuspensi Ekstrak Etanol Kencur
(*Kaempferia Galanga* L.) Menggunakan Metode *Antisolvent Precipitation*

Oleh :

NAVISA DESSAFITRI
NIM : 2211011028
(Program Studi Sarjana Farmasi)

Ekstrak kencur (*Kaempferia galanga* L.) memiliki aktivitas farmakologi yang luas, namun pengembangannya sebagai sediaan obat terkendala oleh rendahnya kelarutan senyawa aktif utamanya yaitu Etil p-metoksisinamat (EPMS) dalam air yang hanya sebesar 0,0301 mg/mL. Nanosuspensi merupakan pendekatan efektif untuk meningkatkan kelarutan dan laju disolusi senyawa hidrofobik. Penelitian ini bertujuan membentuk dan mengkarakterisasi nanosuspensi ekstrak etanol kencur menggunakan metode *antisolvent precipitation*, serta membandingkan laju disolusinya dengan ekstrak kencur tanpa perlakuan. Ekstrak kencur diperoleh melalui maserasi dan distandarisasi sesuai Farmakope Herbal Indonesia. Penetapan kadar EPMS dilakukan menggunakan Kromatografi Cair Kinerja Tinggi (KCKT) yang divalidasi. Formula dioptimasi melalui variasi kecepatan pengadukan, penentuan stabilisator (SLS, Tween 80, HPMC, PVA, PEG 6000), dan variasi konsentrasi stabilisator terpilih. Hasil penelitian menunjukkan bahwa kecepatan pengadukan 1000 rpm dengan penambahan SLS 3% merupakan formulasi optimum yang menghasilkan dispersi jernih dan stabil. Karakterisasi *Particle Size Analyzer* (PSA) menunjukkan ukuran partikel rata-rata sebesar $154,5 \text{ nm} \pm 35,1 \text{ nm}$, indeks polidispersitas $0,486 \pm 0,04$, dan potensial zeta $-51,2 \pm 6,3 \text{ mV}$ yang mengindikasikan stabilitas fisik yang baik. Analisis *Differential Scanning Calorimetry* (DSC) dan *X-Ray Diffraction* (XRD) mengonfirmasi penurunan kristalinitas EPMS menuju fase amorf. Spektroskopi FTIR membuktikan interaksi yang terjadi hanya bersifat fisik tanpa ikatan kimia baru, dan SEM memperlihatkan morfologi partikel yang menjadi berpori. Uji disolusi menunjukkan nanosuspensi mampu melepaskan 76,64% EPMS pada menit ke-60, meningkat signifikan dibandingkan ekstrak murni sebesar 26,55%.

Kata kunci: *Kaempferia galanga* L., etil p-metoksisinamat, nanosuspensi, *antisolvent precipitation*, Sodium Lauryl Sulfate

ABSTRACT
Formation and Characterization of Nanosuspension of Kencur Ethanolic Extract (*Kaempferia galanga* L.) Using the Antisolvent Precipitation Method

By:
NAVISA DESSAFITRI
Student ID Number: 2211011028
(Bachelor of Pharmacy)

Kaempferia galanga L. extract possesses a wide range of pharmacological activities. However, its development into a pharmaceutical dosage form is limited by the poor aqueous solubility of its major active compound, ethyl *p*-methoxycinnamate (EPMC), which is only 0.0301 mg/mL. Nanosuspension is an effective approach to enhance the solubility and dissolution rate of hydrophobic compounds. This study aimed to prepare and characterize a nanosuspension of *K. galanga* ethanol extract using the antisolvent precipitation method and to compare its dissolution rate with that of the untreated extract. The extract was obtained by maceration and standardized according to the Indonesian Herbal Pharmacopoeia. The EPMC content was determined using a validated High-Performance Liquid Chromatography (HPLC) method. The formulation was optimized by evaluating different stirring speeds, stabilizers (SLS, Tween 80, HPMC, PVA, and PEG 6000), and concentrations of the selected stabilizer. The results showed that a stirring speed of 1000 rpm combined with 3% SLS produced the optimum formulation, yielding a clear and physically stable dispersion. Particle Size Analyzer (PSA) characterization revealed an average particle size of 154.5 ± 35.1 nm, a polydispersity index of 0.486 ± 0.04 , and a zeta potential of -51.2 ± 6.3 mV, indicating good physical stability. Differential Scanning Calorimetry (DSC) and X-ray Diffraction (XRD) analyses confirmed a reduction in the crystallinity of EPMC toward an amorphous state. Fourier Transform Infrared (FTIR) spectroscopy demonstrated that the interaction between the extract and excipients was purely physical, with no formation of new chemical bonds, while Scanning Electron Microscopy (SEM) revealed the transformation of particle morphology into a porous structure. Dissolution testing showed that the nanosuspension released 76.64% of EPMC within 60 minutes, representing a significant improvement compared with the untreated extract, which released only 26.55%.

Keywords: *Kaempferia galanga* L., ethyl *p*-methoxycinnamate, nanosuspension, antisolvent precipitation, Sodium Lauryl Sulfate