OPTIMASI DAN KARAKTERISASI *NANOSTRUCTURED LIPID CARRIER* DARI L-DOPA-ASAM LAURAT-MINYAK KEDELAI (NLC-DSL) SEBAGAI KANDIDAT OBAT PARKINSON

SKRIPSI

Diajukan untuk memenuhi sebagian syarat memperoleh Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

Oleh

Ai Susanti

2000706

PROGRAM STUDI KIMIA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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Oleh
Ai Susanti
2000706

Skripsi ini diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Program Studi Kimia Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

LEMBAR PENGESAHAN

OPTIMASI DAN KARAKTERISASI *NANOSTRUCTURED LIPID CARRIER* DARI L-DOPA-ASAM LAURAT-MINYAK KEDELAI (NLC-DSL) SEBAGAI KANDIDAT OBAT PARKINSON

Disusun oleh,

Ai Susanti

2000706

Disetujui dan disahkan oleh,

Pembimbing I

Prof. Dr. Ratnaningsih Eko Sardjono, M.Si.

NIP. 196904191992032002

Pembimbing II

Vidia Afina Nuraini, M.Sc.

NIP. 199307052020122009

Mengetahui,

Ketua Program Studi Kimia FPMIPA UPI

Prof. Fitri Khoerunnisa, Ph.D.

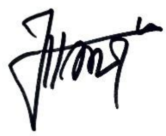
NIP. 197806282001122001

PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul "**Optimasi dan Karakterisasi *Nanostructured Lipid Carrier* dari L-Dopa-Asam Laurat-Minyak Kedelai (NLC-DSL) Sebagai Kandidat Obat Parkinson"** beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan pengutipan atau penjiplakan dengan cara-cara yang tidak sesuai dengan etika keilmuan yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini saya siap menerima risiko atau sanksi apabila kemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak laun terhadap keaslian karya saya.

Bandung, 2024

Yang membuat pernyataan,



Ai Susanti

2000706

KATA PENGANTAR

Puji syukur kepada Allah SWT yang senantiasa memberikan rahmat-NYA sehingga penulis dapat menyelesaikan skripsi yang berjudul "**Optimasi dan Karakterisasi *Nanostructured Lipid Carrier* dari L-Dopa-Asam Laurat-Minyak Kedelai (NLC-DSL) Sebagai Kandidat Obat Parkinson"**. Shalawat dan salam tidak lupa penulis panjatkan kepada Nabi Muhammad SAW, keluarganya, sahabatnya, dan umatnya hingga akhir zaman.

Skripsi ini ditulis untuk memenuhi salah satu syarat menyelesaikan pendidikan jenjang S1 dan mendapatkan gelar Sarjana pada Program Studi Kimia, Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam, Universitas Pendidikan Indonesia. Sistem *Nanostructured Lipid Carrier* (NLC) berbasis asam laurat dan minyak kedelai digunakan dalam penelitian ini untuk mengembangkan sistem penghantar obat L-Dopa pada penyakit parkinson agar mudah diserap oleh tubuh.

Penulis berharap dengan skripsi ini pembaca, penulis, dan peneliti dalam bidang kimia dapat meningkatkan wawasan dan berkontribusi lebih banyak. Penulis menyadari terdapat banyak kekurangan selama proses pelaksanaan maupun penyusunan skripsi. Oleh karena itu, sangat diharapkan kritik dan saran yang bersifat membangun dalam proses penyempurnaan penelitian maupun penyusunan skripsi. Akhir kata, penulis berharap semoga penyusunan skripsi ini dapat bermanfaat khususnya bagi penulis dan umumnya bagi pembaca.

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ABSTRAK

L-Dopa menjadi pilihan utama dalam pengobatan penyakit parkinson yang mempunyai keterbatasan bioavaibilitas dan stabilitas sehingga diperlukan enkapsulasi menggunakan sistem *Nanostructured Lipid Carrier* (NLC). Penelitian ini bertujuan untuk mendapatkan formulasi optimum, karakteristik, nilai *entrapment efficiency* dan profil *drug release* dari produk L-Dopa berbasis asam laurat dan minyak kedelai (NLC-DSL). Pembuatan NLC-DSL dilakukan menggunakan homogenisasi panas dan ultrasonikasi dengan variabel optimasi meliputi perbandingan lipid, konsentrasi surfaktan, dan waktu ultrasonikasi. Karakterisasi NLC-DSL meliputi penentuan ukuran partikel, *polydispersity indeks*, dan zeta potensial menggunakan PSA, morfologi menggunakan TEM, gugus fungsi menggunakan FTIR. Penentuan nilai *entrapment efficiency* dan profil *drug release* dilakukan menggunakan spektrofotometri UV-Vis. Hasil penelitian menunjukkan kondisi optimum pembuatan NLC-DSL diperoleh pada perbandingan asam laurat terhadap minyak kedelai 1:9, konsentrasi surfaktan 2,5% dan waktu ultrasonikasi 40 menit. Produk NLC-DSL yang diperoleh memiliki ukuran partikel 49,4±0,07 nm dengan *polydispersity indeks* 0,451 serta zeta potensial -44,3 mV. Analisis dengan FTIR menunjukkan adanya pergeseran puncak serapan gugus C=O, O-H dan N-H yang mengidentifikasikan adanya interaksi antara senyawa L-Dopa dengan asam laurat dan minyak kedelai. Sementara itu hasil TEM menunjukkan bentuk *spherical* dengan ukuran kisaran 49,73 nm. Persentase *entrapment efficiency* dari NLC-DSL diperoleh sebesar 78,05% dan profil *drug release* NLC-DSL menunjukkan kemampuan melepaskan L-Dopa secara lambat dan terkontrol hingga 6 jam dan mencapai 51,20% pada pH 1,2 dengan mengikuti model kinetika korsmeyer-peppas dan 72,87% pada pH 7,4 dengan mengikuti model kinetika orde nol setelah 24 jam. Berdasarkan hasil yang diperoleh, produk NLC-DSL memiliki potensi sebagai kandidat obat parkinson.

Kata Kunci : L-Dopa, *Nanostructured Lipid Carrier*, Asam Laurat, Minyak Kedelai, Parkinson

ABSTRACT

L-Dopa is the primary choice in the treatment of Parkinson's disease, which has limited bioavailability and stability, requiring encapsulation using the nanostructured lipid carrier system (NLC). The research aims to obtain optimum formulation, characteristics, entrapment efficiency values, and drug release profiles of L-Dopa lauric acid and soy oil-based products. (NLC-DSL). The production of NLC-DSL is done using heat homogenization and ultrasonication with optimization variables covering lipid ratio, surface agent concentration, and ultrasound time. NLC-DSL characterization includes particle size determination, polydispersity index, and zeta potential using PSA, morphology using TEM, and function clustering using FTIR. The determination of entrapment efficiency values and drug release profile is done using UV-Vis spectroscopic photometry. The results show the optimum condition of production of NLC-DSL is obtained at a comparison of lauric acid to soy oil 1:9, a surface agent concentration of 2.5%, and an ultrasound time of 40 minutes. The resulting NLC-DSL product has a particulate size of 49,4±0,07 nm with a polidispersibility index of 0,451 and a potential zeta of -44,3 mV. Analysis with FTIR shows a peak shift in the cluster of C=O, O-H and N-H that identifies the interaction between L-Dopa compounds with laurical acid and soybean oil. Meanwhile, TEM results showed a spherical shape with an average size of 49.73 nm. The percentage entrapment efficiency of NLC-DSL was obtained at 78.05%, and the NLC/DSL drug release profile showed the ability to release L-Dopa slowly and controlled for up to 6 hours and reach 51.20% at pH 1.2 following the Korsmeyer-Peppas kinetic model and 72.87% at pH 7.4 following the zero-order kinetics model after 24 hours. Based on the results obtained, the NLC-DSL product has potential as a candidate drug for Parkinson's disease.

Keywords: L-Dopa, Nanostructured Lipid Carrier, Lauric Acid, Soybean Oil, Parkinson’s disease.

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