NANOFORMULASI L-DOPA MENGGUNAKAN *NANOSTRUCTURED LIPID CARRIER* BERBASIS SETIL PALMITAT DAN ASAM LINOLEAT SEBAGAI KANDIDAT OBAT PARKINSON

SKRIPSI

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

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PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul "**NANOFORMULASI L-DOPA MENGGUNAKAN *NANOSTRUCTURED LIPID CARRIER* BERBASIS SETIL PALMITAT DAN ASAM LINOLEAT SEBAGAI KANDIDAT OBAT PARKINSON**" ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam mayarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila dikemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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ABSTRAK

Penyakit Parkinson merupakan penyakit neurogeneratif yang disebabkan oleh adanya penurunan produksi dopamin akibat terjadinya degenerasi sel saraf dopaminergik yang ireversibel. Terapi penyakit Parkinson dilakukan dengan pemberian L-dopa yang merupakan prekursor dopamin. Namun, dalam proses penghantarannya, L-dopa dapat mengalami degradasi sebelum mencapai sel target. Nanoformulasi menggunakan *Nanostructured Lipid Carrier* (NLC) ditujukan untuk meningkatkan bioavailabilitas L-dopa sehingga dapat meningkatkan efektivitas pengobatan. Tujuan dari penelitian ini adalah untuk menentukan formula optimum L-dopa menggunakan NLC berbasis setil palmitat dan asam linoleat (NLC CP-LA-LDOPA), karakteristik produk, efisiensi pemuatan, kapasitas pemuatan dan persentase pelepasan obat. Metode nanoformulasi dilakukan menggunakan homogenisasi panas dan ultrasonikasi. Karakterisasi NLC CP-LA-LDOPA dilakukan menggunakan PSA, FTIR, ZP, SEM dan TEM. Pengujian efisiensi pemuatan, kapasitas pemuatan dan persentase pelepasan obat dilakukan menggunakan spektrofotometer UV-Vis. Hasil penelitian menunjukkan kondisi optimum proses nanoformulasi L-dopa menggunakan NLC diperoleh pada perbandingan setil palmitat dan asam linoleat sebesar 4:6 dengan *power rate* ultrasonikasi 75% dan ukuran partikel pada kondisi optimum sebesar 145,1 nm. Karakterisasi produk dengan FTIR menunjukkan terdapatnya pergeseran bilangan gelombang pada serapan gugus -OH, dan C=O yang mengindikasikan terjadinya interaksi antara L-dopa dengan matriks lipid. Produk nanoformulasi memiliki nilai *zeta potential* sebesar -16,16 mV yang mengindikasikan terdapatnya potensi untuk membentuk agregat dan didukung oleh hasil SEM. Analisis TEM menunjukkan sampel membentuk agregat dengan morfologi *spherical*. Efisiensi pemuatan dan kapasitas pemuatan diperoleh masing-masing sebesar 76,65% dan 2,45%. Sementara itu, persentase pelepasan obat pada pH 1,2 dan 7,4 masing-masing sebesar 11,54% dan 51,36%. Berdasarkan hasil yang diperoleh, NLC CP-LA-LDOPA memiliki potensi sebagai kandidat obat Parkinson.

Kata kunci: parkinson, L-dopa, *nanostructured lipid carrier*, setil palmitat, asam linoleat

ABSTRACT

Parkinson is a neurogenerative disease caused by a low decrease in dopamine production due to irreversible degeneration of dopaminergic nerve cells. Parkinson's disease therapy is carried out by administering L-dopa which is a precursor of dopamine. However, in the delivery process, L-dopa can experience degradation before reaching the desired target. Nanoformulation using Nanostructured Lipid Carrier (NLC) is intended to increase the bioavailability of L-dopa so that it can increase the effectiveness of treatment. The aim of this study was to determine the optimal L-dopa formula using cetyl palmitic and linoleic acid based NLC (NLC CP-LA-LDOPA), product characteristics, loading efficiency, loading capacity and percentage of drug release. The nanoformulation method was carried out using heat homogenization and ultrasonication. Characterization of the CP-LA-LDOPA NLC was performed using PSA, FTIR, ZP, SEM and TEM. Testing of loading efficiency, loading capacity and percentage of drug release was carried out using a UV-Vis spectrophotometer. The results showed that the optimum conditions for the L-dopa nanoformulation process using NLC were obtained at a ratio of cetyl palmitic and linoleic acid of 4:6 with an ultrasonication power rate of 75% and a particle size of 145.1 nm under optimum conditions. Characterization of the product by FTIR showed that there were wave fluctuations in the absorption of -OH groups, and C=O which indicated an interaction between L-dopa and the lipid matrix. The nanoformulation product has a potential zeta value of -16.16 mV which indicates there is potential to form aggregates and is supported by the SEM results. TEM analysis of the samples showed that they formed aggregates with a spherical morphology. The loading efficiency and loading capacity obtained were 76.65% and 2.45%, respectively. Meanwhile, the percentage of drug release at pH 1.2 and 7.4 was 11.54% and 51.36%, respectively. Based on the results obtained, CP-LA-LDOPA NLC has potential as a candidate for Parkinson's drug.

Keyword: *parkinson, L-dopa, nanostructured lipid carrier, cetyl palmitate, linoleic acid*

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