NANOFORMULASI EKSTRAK KARA BENGUK (*Mucuna pruriens)* MENGGUNAKAN *NANOSTRUCTURED LIPID CARRIER* BERBASIS SETIL PALMITAT DAN ASAM LINOLEAT SEBAGAI KANDIDAT OBAT PARKINSON

SKRIPSI

Diajukan untuk memenuhi sebagian syarat memperoleh gelar sarjana sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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PROGRAM STUDI KIMIA

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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NANOFORMULASI EKSTRAK KARA BENGUK (*Mucuna pruriens*) MENGGUNAKAN *NANOSTRUCTURED LIPID CARRIER* BERBASIS SETIL PALMITAT DAN ASAM LINOLEAT SEBAGAI KANDIDAT OBAT PARKINSON

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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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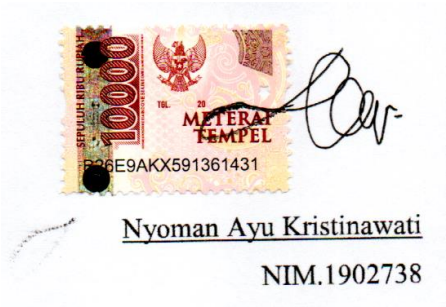
PERNYATAAN KEASLIAN SKRIPSI

Saya menyatakan bahwa skripsi yang berjudul **"Nanoformulasi Ekstrak Kara Benguk (*Mucuna pruriens)* Menggunakan *Nanostructured Lipid Carrier* Berbasis Setil Palmitat dan Asam Linoleat Sebagai Kandidat Obat Parkinson"** ini sepenuhnya adalah karya saya sendiri. Tidak ada di dalamnya yang merupakan plagiat dari karya orang lain dan saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika keilmuan yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi yang dijatuhkan kepada saya apabila kemudian ditemukan adanya pelanggaran terhadap etika keilmuan dalam karya saya ini, atau klaim dari pihak lain terhadap keaslian karya saya ini.

Bandung, Agustus 2023

Yang membuat pernyataan,



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Penelitian ini dilakukan untuk mengeksplorasi pengembangan sistem penghantaran obat, yang memungkinkan ekstrak *Mucuna pruriens* termuat dalam partikel-partikel kecil yang stabil dan mudah diserap oleh tubuh. Dalam penelitian ini, penulis menggunakan sistem *Nanostructured Lipid Carrier* (NLC) berbasis setil palmitat dan asam linoleat sebagai matriks untuk menyalut ekstrak *Mucuna pruriens*.

Penulis berharap skripsi penelitian ini dapat meningkatkan wawasan serta kontribusi bagi penulis, pembaca, dan peneliti selanjutnya dalam bidang kimia. Penulis menyadari bahwa masih terdapat kekurangan pada skripsi ini. Oleh karena itu, sangat diperlukan kritik serta saran yang bersifat membangun dari berbagai pihak untuk perbaikan dan penyempurnaan di kemudian hari.

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ABSTRAK

Kara benguk (*Mucuna pruriens*, Mp) merupakan tanaman yang mengandung senyawa levodopa, sehingga dapat digunakan dalam terapi penyakit Parkinson, suatu penyakit neurodegeneratif yang disebabkan menurunnya produksi dopamin. Nanoformulasi ekstrak Mp menggunakan sistem *Nanostructured Lipid Carrier* (NLC) ditujukan untuk mengatasi keterbatasan bioavaibilitas dan stabilitas ekstrak Mp. Penelitian ini bertujuan untuk memperoleh kondisi optimum, karakteristik, efisiensi pemuatan, kapasitas pemuatan obat, dan persentase pelepasan obat dari produk nanoformulasi ekstrak Mp menggunakan NLC berbasis setil palmitat dan asam linoleat (NLC-CP-LA-Mp). Nanoformulasi dilakukan menggunakan metode homogenisasi panas dan ultrasonikasi dengan optimasi meliputi variasi perbandingan lipid dan *power rate* ultrasonikasi. Karakterisasi produk NLC-CP-LA-Mp meliputi *Particle Size Analyzer* (PSA), Zeta potensial, *Fourier Transformation Infrared* (FTIR), *Scanning Electron Microscopy* (SEM), dan *Transmission Electron Microscopy* (TEM). Efisiensi pemuatan dan kapasitas pemuatan obat dilakukan menggunakan spektrofotometer UV/Vis. Pengujian pelepasan obat dilakukan dengan menggunakan metode *dialysis bag* pada pH 1,2 dan pH 7,4 selama 7 jam (420 menit), kemudian diukur menggunakan spektrofotometer UV/Vis. Hasil penelitian ini menunjukkan bahwa kondisi terbaik nanoformulasi terjadi pada komposisi setil palmitat dan asam linoleat 4:6 dengan *power rate* ultrasonikasi sebesar 75%. Hasil PSA menunjukkan ukuran partikel sebesar 148,1 nm dengan indeks polidipersitas (PDI) sebesar 0,234. Zeta potensial yang terukur sebesar -13,5 mV. Hasil karakterisasi FTIR menunjukkan terjadinya pergeseran pada serapan gugus OH dan C=O yang mengindikasikan adanya interaksi antara ekstrak Mp dengan setil palmitat dan asam linoleat. Hasil karakterisasi SEM dan TEM menunjukan morfologi permukaan adalah *spherical* dengan ukuran berkisar antara 19,0 nm hingga 74,5 nm. Hasil efisiensi pemuatan produk NLC-CP-LA-Mp sebesar 54,6% dengan kapasitas pemuatan obat sebesar 3,37%. Persentase kemampuan pelepasan obat dari produk NLC-CP-LA-Mp tercatat sebesar 14,03% pada pH 1,2 dan 86,66% pada pH 7,4 setelah 420 menit pelepasan. Hasil penelitian ini menunjukkan bahwa NLC-CP-LA-Mp memiliki potensi sebagai kandidat obat dalam penanganan penyakit Parkinson.

Kata Kunci: Kara benguk, *Mucuna pruriens*, nanoformulasi, *nanostructured lipid carrier (NLC)*, penyakit Parkinson.

ABSTRACT

Velvet bean (Mucuna pruriens, Mp) is a plant that contains levodopa, a compound utilized in the therapy of Parkinson's disease, a neurodegenerative disorder resulting from reduced dopamine production. The nanoformulation of Mp extract using the Nanostructured Lipid Carrier (NLC) offers a wide potential to overcome the limitations of bioavailability and stability of Mp extract. This study aims to attain optimum conditions, characteristics, loading efficiency, drug loading capacity, and drug release percentage of the nanoformulation Mp extract using NLC based on cetyl palmitate and linoleic acid (NLC-CP-LA-Mp). Nanoformulation was carried out by hot homogenization and ultrasonication method with a optimation include variation ratio of lipids and power rate of ultrasonication. Characterization of NLC-CP-LA-Mp product include Particle Size Analyzer (PSA), Zeta potential, Fourier Transform Infrared (FTIR), Scanning Electron Microscopy (SEM), and Transmission Electron Microscopy (TEM). Loading efficiency and drug loading capacity were determined by UV/Vis spectrophotometry. Percentage of drug release was evaluated through dialysis bag method at pH 1.2 and pH 7.4 for 7 hours (420 minutes) by UV/Vis spectrophotometry. The result of this study reveal that the optimal nanoformulation condition occurs with a composition of cetyl palmitate and linoleic acid at a ratio of 4:6, along with an ultrasonication power rate 75%. The PSA result indicates a particle size of 148.1 nm with a polydispersity index (PDI) of 0.234. FTIR characterization indicates shifts in the absorption of the OH and C=O groups, which indicates an interaction between Mp extract with cetyl palmitic and linoleic acid. SEM and TEM characterizations illustrates a spherical surface morphology with sizes ranging from 19.0 nm to 74.5 nm. The loading efficiency of the NLC-CP-LA-Mp product is 54.6%, with a drug loading capacity of 3.37%. Percentage of drug release ability of the NLC-CP-LA-Mp product at pH 1.2 was 14,03% and 86.66% at pH 7.4 after 420 minutes of release. These research indicate that NLC-CP-LA-Mp holds potential as a drug candidate for Parkinson's disease treatment.

Keywords: *Velvet bean, Mucuna pruriens, nanoformulation, nanostructured lipid carrier (NLC), Parkinson's disease.*

DAFTAR ISI

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