

# Formulasi dan uji stabilitas fisik terhadap Nanostructured Lipid Carrier sebagai sistem penghantar andrografolid untuk rute parenteral = Formulation and physical stability test of Nanostructured Lipid Carrier as andrographolide delivery system for parenteral route

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## Abstrak

Tanaman sambiloto (*Andrographis paniculate*) adalah salah satu tanaman yang umum digunakan pada obat tradisional di Indonesia. Pada tanaman sambiloto, terdapat senyawa aktif yakni andrografolid. Senyawa andrografolid memiliki banyak aktivitas farmakologi termasuk aktivitas antivirus terhadap virus SARS-CoV-2. Namun, andrografolid memiliki kelemahan yakni rasanya yang pahit, sukar larut dalam air serta bioavailabilitas yang rendah. Sehingga, andrografolid perlu diformulasikan secara optimum guna dapat mengatasi kelemahan andrografolid. Penelitian ini bertujuan untuk memperoleh formulasi Nanostructured Lipid Carrier dengan kandungan andrografolid dengan karakteristik sesuai sediaan parenteral. Formulasi Nanostructured Lipid Carrier dibuat menggunakan zat aktif andrografolid, minyak kelapa sawit, minyak zaitun, gliserin, aquabidest serta variasi gliseril monostearat yakni 2%, 3%, 4%. NLC dibuat menggunakan alat homogenizer selanjutnya dilakukan pengurangan ukuran globul dengan ultrasonikasi amplitude 60% selama 12 menit. NLC diuji karakteristiknya meliputi ukuran globul, potensial zeta, indeks polidispersitas, viskositas, tegangan permukaan, morfologi globul, efisiensi penjerapan serta penetapan kadar. Pada penelitian ini memperlihatkan bahwa formula optimum yakni NLC dengan gliseril monostearate 2%. NLC yang diperoleh memenuhi kriteria sediaan rute parenteral yakni ukuran globul, indeks polidispersitas, zeta potensial, serta efisiensi penjerapan berturut-turut yakni  $438,33 \pm 90,71$ ;  $0,237 \pm 0,01$ ;  $-37,1 \pm 0,34$ ;  $82,8890 \pm 0,10\%$  dan memiliki ukuran globul yakni sferis namun NLC masih belum memenuhi syarat sterilitas. Berdasarkan uji stabilitas yang dilakukan, NLC memiliki kestabilan fisik termasuk uji cucling, uji sentrifugasi, serta uji pada tiga kondisi suhu berbeda. Hasil penelitian yakni formula optimum NLC dengan GMS 2% memiliki kestabilan fisik baik hingga minggu ke-12.

.....Sambiloto (*Andrographis paniculata*) is one of the plants used as traditional medicine in Indonesia. The active substance in Sambiloto, namely andrographolide, has many pharmacological activities. One of them is pharmacological activity against the SARS-CoV-2 virus. However, andrographolide has its limitation such as low solubility in water, low bioavailability, and bitter taste. Therefore, andrographolide needs to be formulated optimally to overcome these limitations. This study aims to obtain the formulation of nanostructured lipid carrier andrographolide with suitable characteristics for parenteral administration. The NLC formulation consisted of andrographolide, palm oil, olive oil, glycerin, and double-distilled water with variances of glyceryl monostearate 2%, 3%, 4%. The manufacture of NLC using a homogenizer was continued with 60% amplitude ultrasonication for 12 minutes. The test of NLC characteristics included globule size, polydispersity index, assay, viscosity, surface tension, globule morphology, encapsulation efficiency, and sterility test. The study showed that the optimum formula NLC with 2% glyceryl monostearate. NLC met the criteria for the parenteral route of administration which is globule size, polydispersity index, zeta potential and encapsulation efficiency, respectively,  $438.33 \pm 90.71$ ;  $0.237 \pm 0.01$ ;  $-37.1 \pm 0.34$ ;  $82.889 \pm 0.10\%$ , and spherical shaped globule but did not meet the requirements for sterility. In

addition, the physical stability of NLC was also carried out including centrifugation test, cycling test, test at three different temperatures. This study showed that formula optimum NLC with GMS 2% also the results of the physical test showed that NLC had good physical stability until 12th week.