

ABSTRAK**PENERAPAN METODE *SIMPLEX LATTICE DESIGN* DALAM PENGEMBANGAN FORMULA DAN KARAKTERISASI *NANOSTRUCTURED LIPID CARRIER* (NLC) VITAMIN E ASETAT DENGAN VARIASI KONSENTRASI LIPID PADAT PRECIROL® DAN SURFAKTAN TEGO® CARE****Oleh:****I Made Gde Mas Bayu Pramana****201FF04024**

Aktivitas antioksidan vitamin E asetat dapat menetralkan radikal bebas sehingga mencegah penuaan dini pada kulit. Vitamin E asetat memiliki nilai Log P $\pm 12,07$, sangat lipofilik, memiliki permeabilitas topikal yang rendah, dan berpotensi terhidrolisis. *Nanostructured Lipid Carrier* (NLC) adalah generasi kedua dari nanoteknologi lipid yang dapat meningkatkan permeabilitas dan stabilitas vitamin E asetat. Penelitian ini bertujuan untuk mendapatkan formula NLC yang memenuhi parameter karakterisasi yang telah ditentukan. Metode *simplex lattice design* digunakan untuk menentukan formula dengan rasio antara lipid padat dan surfaktan, yaitu 3:2.5 (F1), 2:3 (F2), 4:2 (F3), 5:1.5 (F4), dan 6:1 (F5). Dilakukan skrining terhadap lipid padat, lipid cair, dan surfaktan. Kompatibilitas antar bahan diamati dengan *Fourier Transform Infrared Spectroscopy* (FTIR) dan *Differential Scanning Calorimetry* (DSC). NLC dibuat dengan metode homogenisasi panas menggunakan *magnetic stirrer* kemudian disonikasi dengan *probe sonicator*. Dilakukan karakterisasi meliputi ukuran partikel, indeks polidispersitas (PDI), zeta potensial (ZP), dan efisiensi penjerapan (EE). Morfologi NLC diamati dengan menggunakan *Transmission Electron Microscopy* (TEM). Hasil studi menunjukkan bahwa NLC (F1-F5) yang dihasilkan menunjukkan stabilitas yang baik dan memenuhi persyaratan karakterisasi meliputi ukuran partikel (200-400 nm), PDI ($<0,5$), ZP (<-20 mV) dan EE ($>80\%$). TEM memvisualisasikan nanopartikel berbentuk bulat (*spherical*), dan terdispersi dalam sistem secara homogen.

Kata kunci: vitamin E asetat; *Nanostructured Lipid Carrier*; *simplex lattice design*

ABSTRACT**SIMPLEX LATTICE DESIGN APPLICATION ON FORMULA DEVELOPMENT
AND CHARACTERIZATION OF VITAMIN E ACETATE LOADED
NANOSTRUCTURED LIPID CARRIER (NLC) WITH CONCENTRATION
VARIATION OF SOLID LIPID PRECIROL® AND TEGO® CARE SURFACTANT****By:****I Made Gde Mas Bayu Pramana****201FF04024**

Antioxidant activity of vitamin E acetate neutralize free radicals so it can prevent premature skin aging. It has Log P ± 12.07 , highly lipophilic, low permeability, and potentially to be hydrolysed. Nanostructured Lipid Carrier (NLC) is the second generation of lipid nanotechnology that can improve the delivery of vitamin E acetate. This study objective was to obtain NLC formula that fulfil certain specified parameters. Simplex lattice design was used to determine the formula with a ratio between solid lipid and surfactant, including 3:2.5 (F1), 2:3 (F2), 4:2 (F3), 5:1.5 (F4), and 6:1 (F5). Screening of the lipids and surfactant were performed. Compatibility between substances was observed by Fourier Transform Infrared Spectroscopy (FTIR) and Differential Scanning Calorimetry (DSC). NLCs were prepared by homogenization using magnetic stirrer and then sonicated by probe sonicator. The characterizations were performed by measuring particle size, polydispersity index (PdI), zeta potential (ZP), and entrapment efficiency (EE). Morphology of NLCs was observed using Transmission Electron Microscopy (TEM). Study result revealed that the produced NLCs (F1-F5) showed good stability and met the required parameters i.e. particle size (200-400 nm), PdI (<0.5), ZP (<-20 mV) and EE ($>80\%$). TEM visualized that nanoparticles are spherical shape and homogeneously dispersed in the system.

Keywords: vitamin E acetate; Nanostructured Lipid Carrier; simplex lattice design