

INTISARI

Minyak nyamplung (*Calophyllum inophyllum* L.) dan minyak biji anggur (*Vitis vinifera* L.) berpotensi sebagai tabir surya alami karena kandungan senyawa bioaktif yang mampu menyerap radiasi sinar ultraviolet dan bersifat sebagai antioksidan. Minyak nyamplung mengandung *calophyllolide*, *inocalophyllin A*, dan *inocalophyllin B* yang memberikan efek fotoprotektif sedangkan minyak biji anggur kaya akan polifenol, tanin, proantosianidin, dan vitamin E yang berfungsi menetralkan radikal bebas. Penelitian ini bertujuan untuk mengevaluasi pengaruh variasi konsentrasi Karbopol 940 dan HPMC terhadap sifat dan stabilitas fisik emulgel minyak nyamplung dan minyak biji anggur, menentukan formula optimum, serta mengevaluasi aktivitas tabir surya secara *in vitro*.

Penelitian ini menggunakan metode eksperimental dengan optimasi konsentrasi Karbopol 940 dan HPMC melalui pendekatan *Simplex lattice design* menggunakan perangkat lunak *Design Expert®* versi 13. Formula optimum yang diperoleh selanjutnya diuji stabilitasnya menggunakan *cycling test* selama tiga siklus, meliputi pengamatan organoleptik, homogenitas, pH, daya lekat, daya sebar, viskositas, dan tipe emulsi. Verifikasi formula optimum dianalisis menggunakan *Design Expert®* versi 13 dan uji stabilitas dianalisis secara deskriptif dan komparatif. Aktivitas tabir surya dievaluasi secara *in vitro* menggunakan spektrofotometri UV-Vis dengan penentuan nilai *Sun Protection Factor* (SPF), persen transmisi eritema (%TE), dan persen transmisi pigmentasi (%TP).

Hasil penelitian menunjukkan bahwa emulgel minyak nyamplung dan minyak biji anggur dengan konsentrasi Karbopol 940 sebesar 0,75% dan HPMC 1,25% memiliki pH $5,81 \pm 0,04$; viskositas $22.925 \pm 92,92$ mPa·s; daya sebar $26,30 \pm 0,44$ cm²; serta daya lekat $10,61 \pm 0,08$ detik. Selain itu, emulgel menunjukkan aktivitas tabir surya dengan nilai SPF rata-rata $45,65 \pm 0,10$; %TE $0,0092 \pm 0,0001$; dan %TP $1,8817 \pm 0,0055$ berdasarkan pengujian *in vitro*, meskipun terjadi penurunan nilai SPF setelah proses formulasi dibandingkan bahan aktif murni. Secara keseluruhan, emulgel memiliki sifat fisik yang baik, tidak mengalami pemisahan fase selama tiga siklus *cycling test*, stabil dengan tipe emulsi M/A, serta menunjukkan perubahan daya sebar yang signifikan namun tetap berada dalam batas yang direkomendasikan.

Kata kunci: Emulgel, Karbopol 940, HPMC, nyamplung, anggur, tabir surya

ABSTRACT

*Tamanu oil (*Calophyllum inophyllum* L.) and grapeseed oil (*Vitis vinifera* L.) have potential as natural sunscreen agents due to their bioactive compounds that are capable of absorbing ultraviolet radiation and exhibiting antioxidant activity. Tamanu oil contains calophyllolide, inocalophyllin A and inocalophyllin B, which contribute to photoprotective effects, while grapeseed oil is rich in polyphenols, tannin, proanthocyanidins, and vitamin E that function in neutralizing free radicals. This study aimed to evaluate the effect of varying concentrations of Carbopol 940 and HPMC on the physical properties and stability of tamanu oil and grapeseed oil emulgel, to determine the optimum formulation, and to assess its in vitro sunscreen activity.*

An experimental method was employed by optimizing the concentrations of Carbopol 940 and HPMC using a Simplex lattice design approach with Design Expert® software version 13. The optimum formulation obtained was subjected to accelerated stability testing for three cycles, including evaluations of organoleptic properties, homogeneity, pH, adhesiveness, spreadability, viscosity, and emulsion type. Verification of the optimum formulation was analyzed using Design Expert® software version 13 and stability test data were analyzed descriptively and comparatively. Sunscreen activity was evaluated in vitro using UV-Vis spectrophotometry by determining the Sun Protection Factor (SPF), percent erythema transmission (%TE), and percent pigmentation transmission (%TP).

The results showed that the optimum emulgel formulation containing 0.75% Carbopol 940 and 1.25% HPMC exhibited a pH of 5.81 ± 0.04 , viscosity of $22,925 \pm 92.92$ mPa·s, spreadability of $26,30 \pm 0,44$ cm², and adhesiveness of 10.61 ± 0.08 s. The emulgel demonstrated sunscreen activity with an average SPF value of 45.65 ± 0.10 , %TE of 0.0092 ± 0.0001 , and %TP of 1.8817 ± 0.0055 , indicating ultra protection and sunblock category. Although a decrease in SPF value was observed after formulation compared to the pure active ingredients, the emulgel remained physically stable during three cycles of the stability test, showed no phase separation, maintained an oil-in-water emulsion type, and possessed acceptable physical characteristics.

Keywords: *Emulgel, Carbopol 940, HPMC, tamanu, grape, sunscreen*