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**AKTIVITAS TABIR SURYA NANOEMULSI GEL MINYAK BUNGA
CALENDULA (*Calendula officinalis*) SECARA IN VITRO**

ABSTRAK

Latar Belakang: Minyak bunga calendula (*Calendula officinalis*) mengandung senyawa bioaktif dengan sifat antioksidan dan berpotensi sebagai tabir surya alami. Namun, efektivitas dan stabilitasnya dalam formulasi kosmetik masih perlu ditingkatkan. Nanoemulsi dapat membantu mengoptimalkan kualitas dan kinerja minyak bunga calendula sebagai bahan aktif tabir surya.

Tujuan: Penelitian ini bertujuan untuk mengevaluasi karakteristik fisik dan stabilitas tabir surya nanoemulsi gel minyak bunga calendula serta menentukan nilai *Sun Protection Factor* (SPF).

Metode: Nanoemulsi menggunakan energi tinggi dengan Tween 80 sebagai surfaktan dan PEG 400 sebagai ko-surfaktan. Nanoemulsi gel minyak bunga calendula dibuat dengan formula 1 3%, formula 2 5%, dan formula 3 7%. Evaluasi nanoemulsi gel meliputi organoleptis, homogenitas, pH, viskositas, daya lekat, stabilitas melalui uji *cycling test*, serta pengukuran SPF menggunakan spektrofotometri UV-Vis.

Hasil: Nanoemulsi gel minyak bunga calendula formulasi 1, 2, dan 3 memiliki nilai ukuran partikel rata-rata 20,07 nm dan nilai PDI dengan rata-rata 0,271. Nilai pH berada dalam rentang 5,6–6,2, viskositas 500–10.000 cPs, dan daya lekat 2,1–3,5 detik.

Kesimpulan: Formulasi tabir surya nanoemulsi gel minyak bunga calendula memiliki karakteristik yang sesuai. Formulasi tabir surya baik formula 1, 2, dan 3 memiliki nilai SPF yang tinggi dengan kategori proteksi ultra.

Kata kunci: Nanoemulsi, minyak calendula, tabir surya.

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**IN VITRO SUNSCREEN ACTIVITY OF NANOEMULSION GEL
CONTAINING CALENDULA (*Calendula officinalis*) OIL
ABSTRAK**

Background: *Calendula* flower oil (*Calendula officinalis*) contains bioactive compounds with antioxidant properties and has the potential to be a natural sunscreen. However, its effectiveness and stability in cosmetic formulations still need improvement. Nanoemulsions can help optimize the quality and performance of calendula flower oil as an active sunscreen ingredient.

Objective: This study aims to evaluate the physical characteristics and stability of nanoemulsion gel sunscreen containing calendula flower oil and determine its Sun Protection Factor (SPF) value.

Methods: The nanoemulsion was formulated using a high-energy method with Tween 80 and PEG 400 as surfactant and co-surfactant. Evaluations included organoleptic properties, homogeneity, pH, viscosity, spreadability, adhesion, stability through cycle testing, and SPF measurement using UV-Vis spectrophotometry.

Results: Nanoemulsion gel formulations 1, 2, and 3 had an average particle size of 20.07 nm and a PDI value averaging 0.271. The pH ranged from 5.6 to 6.2, viscosity from 500 to 10,000 cPs, and adhesion time from 2.1 to 3.5 seconds..

Conclusion: The nanoemulsion gel sunscreen formulations containing calendula flower oil exhibited appropriate characteristics and good stability. Formulations 1, 2, and 3 had high SPF values, categorized as ultra protection.

Keywords: Nanoemulsion, calendula oil, sunscreen.