

ABSTRAK

Paparan radiasi *ultraviolet B* (UVB) diketahui dapat meningkatkan proses melanogenesis yang berkontribusi terhadap terjadinya hiperpigmentasi dan kerusakan kulit. *Asiaticoside* dari pegagan (*Centella asiatica*) dan *kojic acid* merupakan agen antimelanogenesis yang memiliki mekanisme kerja berbeda sehingga berpotensi digunakan secara kombinasi untuk mengatasi efek paparan UVB. Pengembangan sistem penghantaran berbasis gel nanoemulsi diharapkan dapat meningkatkan penetrasi dan efektivitas bahan aktif pada kulit. Penelitian ini bertujuan mengevaluasi efektivitas gel nanoemulsi yang mengandung *asiaticoside* pegagan dan *kojic acid* terhadap kerusakan kulit akibat paparan UVB pada tikus melalui pengamatan makroskopis. Penelitian ini merupakan penelitian eksperimental *in vivo* menggunakan 30 ekor tikus jantan yang dibagi ke dalam enam kelompok, yaitu kontrol negatif, kontrol UVB, kontrol positif (arbutin 2%), serta tiga kelompok perlakuan yang diberikan gel nanoemulsi dengan konsentrasi ekstrak pegagan 0,1%, 0,2%, dan 0,4%. Melanogenesis diinduksi menggunakan radiasi UVB, kemudian dilakukan aplikasi sediaan secara topikal selama tujuh hari. Efektivitas sediaan dievaluasi berdasarkan parameter *scoring lesion score* dan *transepidermal water loss* (TEWL). Hasil penelitian menunjukkan bahwa gel nanoemulsi *asiaticoside* dan *kojic acid* konsentrasi 0,2% dan 0,4% efektif memperbaiki kerusakan kulit akibat paparan UVB berdasarkan parameter *scoring lesion score* dan TEWL. Konsentrasi 0,2% menunjukkan kecenderungan efektivitas terbaik dengan nilai TEWL terendah ($7,30 \pm 1,05$ g/hm²), meskipun tidak berbeda bermakna dengan konsentrasi 0,4% pada parameter TEWL ($p = 0,516$) maupun *scoring lesion score* ($p = 0,811$). Dengan demikian, gel nanoemulsi *asiaticoside* pegagan dan *kojic acid* berpotensi digunakan sebagai sediaan topikal untuk memperbaiki kerusakan kulit akibat paparan UVB.

Kata kunci: *asiaticoside*, *kojic acid*, gel nanoemulsi, antimelanogenesis, *ultraviolet B*

ABSTRACT

Ultraviolet B (UVB) radiation is known to enhance the melanogenesis process, contributing to skin hyperpigmentation and damage. Asiaticoside derived from *Centella asiatica* and kojic acid are antimelanogenic agents with different mechanisms of action, making their combination a promising approach to counteract the effects of UVB exposure. The development of a nanoemulsion gel delivery system is expected to improve the penetration and topical effectiveness of these active compounds. This study aimed to evaluate the effectiveness of a nanoemulsion gel containing asiaticoside from *Centella asiatica* and kojic acid in improving UVB-induced skin damage in rats through macroscopic observation. This study was an in vivo experimental study using 30 male rats divided into six groups: a negative control group, a UVB-induced control group, a positive control group (2% arbutin), and three treatment groups receiving nanoemulsion gels containing *Centella asiatica* extract at concentrations of 0.1%, 0.2%, and 0.4%. Melanogenesis was induced by UVB radiation, followed by topical application of the formulations for seven days. The effectiveness of the formulations was evaluated based on scoring lesion score and transepidermal water loss (TEWL) parameters. The results showed that nanoemulsion gels containing asiaticoside and kojic acid at concentrations of 0.2% and 0.4% effectively improved UVB-induced skin damage based on scoring lesion score and TEWL. The 0.2% concentration demonstrated the best tendency, with the lowest TEWL value ($7.30 \pm 1.05 \text{ g/hm}^2$), although it was not significantly different from the 0.4% concentration in either TEWL ($p = 0.516$) or scoring lesion score ($p = 0.811$). Therefore, a nanoemulsion gel containing asiaticoside from *Centella asiatica* and kojic acid has the potential to be used as a topical formulation for improving UVB-induced skin damage. Keywords: asiaticoside, kojic acid, nanoemulsion gel, antimelanogenesis, ultraviolet B.

