

INTISARI

Penuaan seluler pada sel kulit menyebabkan hilangnya integritas dan fungsi kulit sehingga kulit menjadiberkerut, kendur, kasar dan hilang elastisitasnya. Minyak cengkeh (*Syzygium aromaticum* (L.) Merr. & Perry) memiliki aktivitas antioksidan tinggi yang dapat digunakan sebagai solusi. Akan tetapi, pengaplikasian langsung pada kulit dapat menyebabkan iritasi. Penelitian ini bertujuan untuk menelusuri aktivitas anti-*senescence* seluler minyak cengkeh (MC) terhadap sel fibroblast NIH-3T3 dan melakukan optimasi formula nanoemulsi minyak cengkeh (NMC).

MC diperoleh dari hidrodestilasi. Uji aktivitas anti-*senescence* seluler dilakukan menggunakan *senescence associated β -galactosidase* (SA- β -Gal) *assay*. Formulasi dan optimasi NMC menggunakan metode pengadukan tinggi stirer dan ultrasonikasi serta *simplex lattice design* (SLD) dengan aplikasi *Design Expert* (DE) 10.0. Efek MC dan NMC terhadap viabilitas sel diamati dengan *MTT assay*. Analisis data dilakukan secara deskriptif, regresi linear dan uji statistik dengan *One Way ANOVA* dan *Paired Samples T-test*.

Hidrodestilasi menghasilkan MC dengan rendemen sebanyak 3,091%^{b/b}. Perlakuan MC 20 dan 40 $\mu\text{g/mL}$ mampu menghambat *senescence* seluler ($p < 0,01$) terhadap sel fibroblast NIH-3T3. Formula NMC komposisi fase minyak (minyak zaitun) : surfaktan + ko-surfaktan (tween 80 + PEG 400) yaitu (1,9 : 8,1) (v/v) dengan perbandingan surfaktan : ko-surfaktan (2 : 3) (v/v) merupakan formula optimum dengan hasil respon persen transmitan sebesar 92,21% ($p < 0,05$). MC dan NMC tidak bersifat sitotoksik terhadap sel fibroblast NIH-3T3 pada konsentrasi dibawah 40 $\mu\text{g/mL}$ ($p < 0,01$). MC berpotensi untuk dikembangkan sebagai anti-*senescence* seluler dan dikembangkan menjadi sediaan NMC.

Kata kunci: *cengkeh, senescence, NIH-3T3, nanoemulsi*

ABSTRACT

Cellular aging of skin cells causes loss of integrity and function of the skin so that the skin becomes wrinkled, sagging, rough and loses its elasticity. Clove oil (*Syzygium aromaticum* (L.) Merr. & Perry) has high antioxidant activity that can be used as a solution. However, direct application to the skin can cause irritation. This study aims to trace the anti-senescence activity of cellular clove oil (CO) against NIH-3T3 fibroblast cells and to optimize the clove oil nanoemulsion (CON) formula.

CO is obtained from hydrodistillation. Cell anti-senescence activity test was carried out using senescence associated β -galactosidase (SA- β -Gal) assay. CON formulation and optimization using stirring and ultrasonication high stirring methods and simplex lattice design (SLD) with the Design Expert (DE) 10.0 application. The effects of MC and CON on cell viability were observed with MTT assay. Data analysis was performed descriptively, linear regression and statistical tests with One Way ANOVA and Paired Samples T-test.

Hydrodistillation produces CO with a yield of 3.091% b/b. CO 20 and 40 $\mu\text{g/mL}$ treatments were able to inhibit cellular senescence ($p < 0.01$) against NIH-3T3 fibroblast cells. NMC formula composition of oil phase (olive oil): surfactant + co-surfactant (tween 80 + PEG 400) namely (1.9: 8.1) (v/v) with a surfactant: co-surfactant ratio (2: 3) (v/v) is the optimum formula with the results of percent transmittance response of 92.21% ($p < 0.05$). MC and NMC were not cytotoxic against NIH-3T3 fibroblast cells at concentrations below 40 $\mu\text{g/mL}$ ($p < 0.01$). CO has the potential to be developed as cellular anti-senescence and developed into CON preparations.

Keywords: *clove, senescence, NIH-3T3, nanoemulsion*