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UJI AKTIVITAS ANALGETIK NANOPARTIKEL EKSTRAK BUNGA CENGKEH *(Syzygium Aromaticum)* SECARA IN VIVO

ABSTRAK

Latar belakang: Nyeri merupakan respons fisiologis kerusakan jaringan yang memerlukan analgetik. Bunga cengkeh berpotensi sebagai analgetik alami, dan formulasi bentuk nanopartikel dapat meningkatkan efektivitasnya. Penelitian bertujuan mengevaluasi karakteristik nanopartikel ekstrak bunga cengkeh, menganalisis efektivitas antar konsentrasi terhadap respon geliat mencit jantan galur Balb/c, serta menentukan konsentrasi paling efektif secara in vivo.
Metode: Penelitian ini bersifat eksperimental. Ekstraksi dilakukan melalui maserasi dengan etanol 96%, dilanjutkan standarisasi nonspesifik dan skrining fitokimia. Nanopartikel dibuat dengan konsentrasi 0,5%, 1%, dan 1,5%. Karakterisasi meliputi ukuran partikel, indeks polidispersitas, dan persen transmitan. Uji aktivitas analgetik dilakukan menggunakan metode *writhing test* pada mencit jantan galur Balb/c. Analisis data menggunakan uji Shapiro-Wilk, uji homogenitas, One Way ANOVA, dan Post Hoc Bonferroni.
Hasil: Skrining fitokimia pada ekstrak bunga cengkeh menunjukkan kandungan flavonoid, alkaloid, steroid, fenol, tanin, dan saponin. Ukuran partikel pada nanopartikel ekstrak bunga cengkeh konsentrasi 0,5%, 1%, dan 1,5% berturut-turut adalah 412,1 nm; 239,0 nm; dan 670,6 nm, dengan nilai PDI 0,460; 0,555; dan 0,504, serta persen transmitan 99,901%; 99,953%; dan 98,972%. Rata-rata geliat mencit masing-masing 29,8; 6,0; 9,8; 5,4; dan 5,0. Persentase proteksi nyeri sebesar 67,12%; 81,88%; dan 83,23%, dengan efektivitas analgetik 84,03%; 102,51%; dan 102,95%. Terdapat perbedaan signifikan antara konsentrasi 0,5% dengan 1% dan 1,5% ($p<0,05$), namun tidak signifikan antara 1% dan 1,5%.
Kesimpulan: Karakteristik fisik nanopartikel menunjukkan bahwa ukuran partikel dan persen transmitan memenuhi kriteria, nilai PDI belum optimal pada konsentrasi 1% dan 1,5%. Konsentrasi 1% dan 1,5% memiliki efektivitas analgetik tertinggi, dan konsentrasi paling efektif.

Kata Kunci: Bunga Cengkeh, Nanopartikel, Analgetik, *Writhing Test*

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IN VIVO ANALGESIC ACTIVITY TEST OF CLOVE FLOWER EXTRACT (SYZYGIUM AROMATICUM) NANOPARTICLES

ABSTRACT

Background: *Pain is a physiological response to tissue damage that requires analgesics. Clove flowers have potential as a natural analgesic, and nanoparticle formulation can enhance their effectiveness. This study aimed to evaluate the characteristics of clove flower extract nanoparticles, analyze the effectiveness of different concentrations on the writhing response of male Balb/c mice, and determine the most effective concentration in vivo.*
Methods: *This study was experimental. Extraction was carried out through maceration with 96% ethanol, followed by nonspecific standardization and phytochemical screening. Nanoparticles were prepared at concentrations of 0.5%, 1%, and 1.5%. Characterization included particle size, polydispersity index, and transmittance percentage. Analgesic activity was tested using the writhing test on male Balb/c mice. Data were analyzed using the Shapiro-Wilk test, homogeneity test, one-way ANOVA, and post hoc Bonferroni test.*
Results: *Phytochemical screening of clove flower extract showed flavonoids, alkaloids, steroids, phenols, tannins, and saponins. The particle sizes of clove flower extract nanoparticles at concentrations of 0.5%, 1%, and 1.5% were 412.1 nm; 239.0 nm; and 670.6 nm, respectively, with PDI values of 0.460; 0.555; and 0.504, and transmittance percentages of 99.901%; 99.953%; and 98.972%. The average writhing of mice was 29.8; 6.0; 9.8; 5.4; and 5.0, respectively. The percentage of pain protection was 67.12%; 81.88%; and 83.23%, with analgesic effectiveness of 84.03%; 102.51%; and 102.95%. There was a significant difference between the 0.5% and 1% and 1.5% concentrations ($p<0.05$), but not between 1% and 1.5%.*
Conclusion: *The physical characteristics of the nanoparticles indicate that the particle size and transmittance percentage meet the criteria, but the PDI value is not optimal at the 1% and 1.5% concentrations. The 1% and 1.5% concentrations had the highest analgesic effectiveness, and the most effective concentration.*

Keywords: *Clove Flower, Nanoparticles, Analgesic, Writhing Test*