

ABSTRAK

Penelitian ini bertujuan untuk merancang formula nanoemulsi ekstrak kombucha teh hitam dengan tujuan menganalisis kandungan fitokimia, kadar flavonoid total, mengevaluasi basis dan formula nanoemulsi, serta aktivitas antibakteri dan sitotoksik dari nanoemulsi tersebut. Metode penelitian meliputi analisis fitokimia untuk alkaloid, flavonoid, fenol, saponin, dan steroid/terpenoid. Kadar flavonoid diukur menggunakan spektrofotometri UV-Vis pada panjang gelombang 371,50 nm dengan kuersetin sebagai standar. Tiga kelompok formula dipilih berdasarkan kadar flavonoid tertinggi pada hari fermentasi ke-12, 18, dan 20. Basis nanoemulsi dievaluasi melalui organoleptik, pH, kekeruhan, *freeze and thaw*, bobot jenis, viskositas, dan analisis ukuran partikel. Evaluasi formula nanoemulsi meliputi uji pH, viskositas, *freeze and thaw*, iritasi, bobot jenis, analisis ukuran partikel, organoleptik, dan persen transmittan. Uji antibakteri dilakukan dengan metode difusi cakram menggunakan *Staphylococcus aureus* dan MRSA sebagai kontrol, sedangkan uji sitotoksik dilakukan dengan *MTT Assay*.

Hasil penelitian menunjukkan bahwa ekstrak kombucha teh hitam mengandung fenol, flavonoid, saponin, triterpenoid, dan steroid. Kadar flavonoid pada hari fermentasi ke-12, 18, dan 20 adalah 59,7%, 80,278%, dan 71,95%. Basis dan formula nanoemulsi yang dibuat telah memenuhi syarat. Nanoemulsi ekstrak kombucha teh hitam memiliki efek antibakteri kuat terhadap *P. acnes* dan efek moderat terhadap *S. aureus* serta MRSA. Nilai IC₅₀ nanoemulsi ekstrak kombucha teh hitam adalah 73,84 µg/mL, menunjukkan aktivitas sitotoksik moderat terhadap sel fibroblas preputium. Secara keseluruhan, penelitian ini berhasil mengembangkan dan mengevaluasi formula nanoemulsi ekstrak kombucha teh hitam dengan potensi menjanjikan sebagai agen antibakteri dan sitotoksik.

Kata kunci : kombucha teh hitam, nanoemulsi, *acne vulgaris*, *P.acnes*

ABSTRACT

*This study designed aims to a nanoemulsion formula of kombucha black tea extract with the aim of analyzing the phytochemical content, total flavonoid levels, evaluating the nanoemulsion base and formula, as well as the antibacterial and cytotoxic activities of the nanoemulsion. The research methods included phytochemical analysis for alkaloids, flavonoids, phenols, saponins, and steroids/triterpenoids. Flavonoid levels were measured using UV-Vis spectrophotometry at a wavelength of 371.50 nm with quercetin as the standard. Three formula groups were selected based on the highest flavonoid levels on fermentation days 12, 18, and 20. The nanoemulsion base was evaluated for organoleptics, pH, turbidity, freeze and thaw stability, specific gravity, viscosity, and particle size analysis. The nanoemulsion formula was evaluated for pH, viscosity, freeze and thaw stability, irritation, specific gravity, particle size analysis, organoleptics, and percent transmittance. Antibacterial testing was conducted using the disk diffusion method with *Staphylococcus aureus* and MRSA as controls, while cytotoxicity testing was performed using the MTT Assay.*

*The results showed that kombucha black tea extract contains phenols, flavonoids, saponins, triterpenoids, and steroids. The flavonoid levels on fermentation days 12, 18, and 20 were 59.7%, 80.278%, and 71.95%, respectively. The developed nanoemulsion base and formula met the required criteria. The kombucha black tea extract nanoemulsion exhibited strong antibacterial effects against *P. acnes* and moderate effects against *S. aureus* and MRSA. The IC₅₀ value of the ethanol extract nanoemulsion of kombucha black tea was 73.84 µg/mL, indicating moderate cytotoxic activity against preputium fibroblast cells. Overall, this study successfully developed and evaluated a kombucha black tea extract nanoemulsion formula with promising potential as an antibacterial and cytotoxic agent.*

Keywords: kombucha black tea, nanoemulsion, acne vulgaris, P. acnes