

# Formulasi dan uji stabilitas fisik nanoemulsi gel tea tree oil (*Melaleuca alternifolia*) serta uji aktivitas antibakteri secara in vitro = Formulation and physical stability test of tea tree oil (*Melaleuca alternifolia*) nanoemulsion gel and its in vitro antibacterial activity test

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## Abstrak

Tea tree oil merupakan minyak atsiri dari tanaman *Melaleuca alternifolia* yang memiliki khasiat sebagai antibakteri. Sifat hidrofobik dari tea tree oil menimbulkan masalah dalam formulasi produk obat maupun kosmetik yang berbasis air. Penelitian ini bertujuan untuk memformulasikan tea tree oil dalam bentuk nanoemulsi gel dan menguji stabilitas fisik serta aktivitas antibakterinya secara in vitro. Nanoemulsi gel dibuat dengan berbagai konsentrasi tea tree oil yaitu 5%, 7%, dan 9% menggunakan tween 80 sebagai surfaktan dan propilenglikol sebagai kosurfaktan. Sediaan nanoemulsi gel tea tree oil menunjukkan penampilan fisik yang stabil selama penyimpanan 8 minggu pada suhu rendah ( $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ) dan suhu ruang ( $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ), cycling test, serta uji mekanik. Formula terbaik adalah nanoemulsi gel F1 yang mengandung tea tree oil 5% karena memiliki stabilitas yang baik, ukuran globul yang lebih kecil, dan viskositas yang lebih kental. Hasil uji aktivitas antibakteri secara in vitro menunjukkan bahwa sediaan nanoemulsi gel tea tree oil memiliki aktivitas antibakteri terhadap *Propionibacterium acnes* dengan terbentuknya zona hambat. Semakin tinggi konsentrasi tea tree oil dalam sediaan (5%, 7%, dan 9%) memberikan rata-rata zona hambat yang semakin besar ( $28,33 \pm 0,88$  mm;  $30,33 \pm 0,33$  mm; dan  $31,67 \pm 0,33$  mm).

.....Tea tree oil is an essential oil of *Melaleuca alternifolia* which has antibacterial activity. Hydrophobic properties of tea tree oil cause problem in the formulation of drug product as well as water-based cosmetics. This study aims to formulate tea tree oil into nanoemulsion gel dosage form and evaluate its physical stability and antibacterial activity. Nanoemulsion gel was formulated in various concentrations of tea tree oil, which were 5%, 7% and 9% using tween 80 as surfactant and propyleneglycol as cosurfactant. Nanoemulsion gel tea tree oil showed stable physical appearance during 8 weeks of storage at low temperature ( $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ) and room temperature ( $25^{\circ} \pm 2^{\circ}\text{C}$ ), cycling test, as well as mechanical test. The best formula is nanoemulsion gel F1 containing 5% tea tree oil because it has good stability, smaller globule size, and more viscous. Results of antibacterial activity in vitro studies showed that tea tree oil nanoemulsion gel had antibacterial activity against *Propionibacterium acnes* by the formation of inhibition zone. Higher concentration of tea tree oil in nanoemulsion gel (5%, 7%, and 9%) showed greater mean inhibition zone ( $28,33 \pm 0,88$  mm;  $30,33 \pm 0,33$  mm; and  $31,67 \pm 0,33$  mm).