# INTISARI

Keluhan muskuloskeletal seperti nyeri otot, pegal, dan kram ringan sering dialami masyarakat Indonesia dan menjadi salah satu gangguan kesehatan yang umum. Salah satu bentuk terapi topikal yang digunakan untuk meredakan keluhan tersebut adalah *hot* emulgel yang mengandung metil salisilat, mentol, dan camphor sebagai *counterirritant*. Hasil formulasi awal *hot* emulgel di Industri X menunjukkan mutu produk yang belum sesuai target, terutama pada parameter viskositas, daya sebar, dan kestabilan sediaan. Dari permasalahan tersebut, dilakukan optimasi formula *hot* emulgel agar diperoleh formula dengan mutu fisik yang stabil.

Optimasi formula dilakukan dengan metode *Design of Experiment* (DoE) menggunakan rancangan *Simplex Lattice Design* pada perangkat lunak analisis statistik. Dua komponen yang dioptimasi adalah Natursol™ Emi 132 sebagai emulgator serta pengental dan oleum cocos sebagai basis minyak. Evaluasi dilakukan terhadap parameter fisik meliputi uji viskositas, daya sebar, dan pH. Formula optimum hasil prediksi kemudian diverifikasi melalui pengujian organoleptis, homogenitas, pH, viskositas, daya sebar, daya lekat, dan stabilitas untuk memastikan kesesuaian antara hasil prediksi dan hasil uji aktual.

Hasil penelitian menunjukkan bahwa variasi proporsi Natursol™ Emi 132 dan oleum cocos memengaruhi karakteristik fisik hot emulgel, meliputi viskositas, daya sebar, dan pH. Natursol™ Emi 132 meningkatkan viskositas namun menurunkan daya sebar dan pH, sedangkan oleum cocos menurunkan viskositas serta meningkatkan daya sebar dan pH sediaan. Optimasi menggunakan pendekatan *Design of Experiment* (DoE) menghasilkan formula optimum dengan komposisi Natursol™ Emi 132 sebesar 2,48% dan oleum cocos sebesar 2,02%. Formula tersebut menunjukkan mutu fisik yang baik, ditandai dengan sifat organoleptis stabil, homogenitas yang seragam, viskositas 11.986,67 ± 283,78 cPs, pH 5,45 ± 0,015, daya sebar 4,98 ± 0,257 cm, daya lekat lebih dari 1 detik, tipe krim O/W, serta stabilitas fisik yang baik selama penyimpanan 2 minggu.

**Kata Kunci:** Emulgel, Natursol™ Emi 132, Oleum Cocos, Optimasi Formula

# *ABSTRACK*

Musculoskeletal complaints such as muscle pain, soreness, and mild cramps are commonly experienced by the Indonesian population and represent a prevalent health problem. One topical therapy used to relieve these conditions is hot emulgel containing methyl salicylate, menthol, and camphor as counterirritant agents. Preliminary formulation of hot emulgel at Industry X indicated that the product quality did not meet the desired specifications, particularly in terms of viscosity, spreadability, and formulation stability. Therefore, formulation optimization was required to obtain a hot emulgel with stable physical properties.

Formulation optimization was conducted using the Design of Experiment (DoE) approach with a Simplex Lattice Design implemented in statistical analysis software. Two formulation components were optimized, namely Natursol™ Emi 132 as an emulsifier and thickening agent, and oleum cocos as the oil phase. Physical evaluations were performed on viscosity, spreadability, and pH. The predicted optimum formulation was subsequently verified through organoleptic evaluation, homogeneity, pH, viscosity, spreadability, adhesiveness, cream type, and stability testing to ensure agreement between predicted and experimental results.

The results showed that variations in the proportions of Natursol™ Emi 132 and *oleum cocos* significantly affected the physical characteristics of the hot emulgel, including viscosity, spreadability, and pH. Natursol™ Emi 132 increased the viscosity but tended to reduce spreadability and pH, whereas *oleum cocos* decreased viscosity and increased spreadability and pH. Optimization using the Design of Experiment (DoE) approach yielded an optimum hot emulgel formulation containing 2.48% Natursol™ Emi 132 and 2.02% *oleum cocos*. The optimum formulation exhibited good physical quality, characterized by stable organoleptic properties, uniform homogeneity, a viscosity of 11,986.67 ± 283.78 cPs, a pH of 5.45 ± 0.015, spreadability of 4.98 ± 0.257 cm, adequate adhesiveness (>1 s), an O/W cream type, and good physical stability during two weeks of storage.

**Keywords:** Emulgel, Formula Optimization, Natursol™ Emi 132, Oleum Cocos