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Optimization Formula of Caffeine Nano-EMULGEL using Isopropyl Myristate and Isopropanol as Penetration Enhancer and Evaluation on its Penetration in Vitro

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ABSTRACT

Caffeine as an active ingredient in anti-cellulite products has a high hydrophilicity property which makes it difficult for it to enter the stratum corneum (SC). Adding penetration enhancer such as isopropyl myristate (IPM) and isopropanol (IPA), to the formula nano-emulgel would increase caffeine penetration into the skin. In this research, nano-emulgel preparations were made with various combination of IPM and IPA as penetration enhancers. Optimization was performed using the Simplex Lattice design method. The optimized responses were particle size and zeta potential of nano emulsion as well as pH, viscosity, spread ability, and adhesion of nano-emulgel. The results of optimization showed an optimal formula consisting of a combination of IPM and IPA with a ratio of 2.98 : 2.02 (% v/v). The verification data with the prediction was made using the optimal formula and analysed using the one sample t-test method. The response of particle size, pH, viscosity, spread ability, and adhesiveness showed no significant difference ($p>0.05$) between the predicted value and the verification formula except for zeta potential value. The optimal nano-emulgel formula has a cumulative caffeine penetrated area for 8 hours 12,099.5 ± 199.54 µg/cm2 (related to around 24% caffeine) and flux 44.543 µg/cm2.minute.

Keywords: *Caffeine; Enhancer; Optimization; Penetration;* Simplex Lattice Design