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Demonstration of multivariate data analysis for the development of *Boswellia serratta* plant extracts containing nanoemulsion

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The chemometric techniques have been used to demonstrate the role of nanoemulsion components on release of active herbal principle present in the spray dried *Boswellia serratta* plant extract. Nanoemulsions were screened for determining the solubility of boswellic acids (BAs) in various systems. Isopropyl myristate, Tween 80 and Transcutol PR were selected as components of the nanoemulsion to draw phase diagrams. Simplex lattice mixture design was applied to optimize the percentual composition of nanoemulsions for the measurement of droplet size and cumulative permeation for topical delivery. The permeability coefficient and droplet size were modelled with set of variables by partial least squares (PLS). Partial least square regression analysis was done through Excel STAT (XL STAT) to influence mixture composition on permeation behavior of drug from the nanoemulsion as calculated models revealed good predictive abilities. The optimized nanoemulsion was incorporated into hydrogel using Carbopol 940 for ease of topical application. *Ex vivo* skin permeation and *in vivo* anti-inflammatory study were conducted to evaluate the potential of optimized nanoformulations. The spherical droplet shape was confirmed by TEM analysis. About 3.25 fold increase in flux was seen in case of nanoemulsion, nanogel showed 1.45 fold increase in flux as compared to carbopol gel with highest enhancement ratio 4.57 and 1.59 respectively. Physicochemically stable and non-irritant hydrogel was developed to deliver significant amounts of active herbal principle through skin and showed significant percentage inhibition in rat paw edema. Our study illustrated scientific and statistical evidence for the potential of developed nanoemulsion as possible alternative to traditional formulations.

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