A trio symphony nanoemulgel composed of seabuckthorn oil, lavender oil and thymoquinone for treatment of diabetic wound healing

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Abstract

In traditional medicine, thymoquinone (TQ) is a common herb containing known therapeutic uses to treat multiple diseases. By using the phase inversion composition approach, the ternary phase diagram was created using the weight ratio of S_{mix} (Cremophor ELP: Transcutol-P): oil: water for the generation of oil in water for nanoemulsion (NE), This method has not been thoroughly investigated applying a Randomised I-optimal mixture design. Using a traditional pseudo-ternary phase diagram, the surfactant mixture (Smix) was assessed in order to identify the S_{mix} ratio. The essential oil blend of lavender and seabuckthorn oil (SLO) has strong anti-inflammatory, antibacterial, and antioxidant effects. According to droplet size, PDI, and thermodynamic stability experiment, the optimised NE showed stability. For therapeutic applications, these findings could be helpful in developing NE with low energy techniques that have higher kinetic stability. After evaluation, the TQ content was discovered to be 98.54±0.08%. In order to create nanoemulgel, 1% carbopol®934 was added to the optimised TQ loaded NE (SLO). The TQ loaded nanoemulgel system (DIAGEL) that showed pseudoplastic behaviour, which is advantage for topical application. The percentage inhibition of ABTS free radical was 14.36±3.02% and 90.93±0.31% for the DIAGEL formulation and blank SLO nanoemulsion loaded gel (BGEL). Moreover, the formulations demonstrated in vitro antibacterial activity against *Candida albicans* and *S. aureus*. When BGEL and DIAGEL were used to treat wounds in vivo in male SD rats, there was a significant decrease in the amount of IL-6, IL-1β, TNF-α and MMP-9.

KEYWORDS: Diabetic wound healing, nanoemlusion, nanoemulgel, anti-inflammatory.