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Preparation of Tadalafil-Nanoemulsion Using Phase Inversion Temperature for Topical Drug Delivery in the Treatment of Androgenic Alopecia

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ABSTRACT

Introduction: Alopecia is a common dermatological disorder. The proposed drug, Tadalafil, has a mechanism of action that inhibits the breakdown of cGMP by PDE5, which can prolong smooth muscle relaxation and increase blood flow. It also works as a minoxidil. Nanoemulsions are products with high stability against sedimentation and creaming. There are various techniques to produce Nanoemulsions. The proposed method is the PIT, a low-energy method that has been considered for cost reduction. The aim was the preparation of Tadalafil-nanoemulsion by Tadalafil-nanoemulsion by the PIT method and the effects of the different factors involved in preparing the formulations for topical drug delivery.

Methods and Materials: Tadalafil-nanoemulsions were prepared using the PIT method, and the effects of change in NaCl and surfactant concentrations on stability, phase inversion temperature, and particle size were investigated. Conductivity and particle size were also recorded.

Results: The ionic strength has effectively impacted the formation of stable Nanoemulsions and their particle size. Increasing NaCl concentration from 0.1 to 0.4 M reduced the particle size from 113 nm to 87 nm. The stability of nanoemulsions in 0, 0.05, and 0.1 M were higher than those in higher concentrations. Increasing the SOR factor associated with the surfactant concentration from 0.2 to 0.4 decreased the particle size from 242 nm to 113 nm. Increased heating-cooling cycles up to 4 times and reduced particle size from 457 to 399 nm.

Conclusion and Discussion: Nanoemulsions have been prepared using the PIT emulsification method for an oil/ nonionic surfactant/ water system. This study investigates the effects of NaCl and SOR on HLB temperature. Electrical conductivity was measured as an important PIT indicator, and particle size was measured. It provides some valuable insights into the formation of Nanoemulsions that can be used as delivery systems for various industrial applications.

Keywords: Alopecia, Drugs, Tadalafil