

Physalis peruviana oil based NLCs for dermal drug delivery

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ABSTRACT

Nanostructured lipid carriers (NLC) are a new progression in the area of lipid nanoparticles which are preferred for topical use. NLC possess reasonable solubility enhancement capacity of poorly soluble drugs, which create a high concentration gradient to aid the permeation of drug. The endeavor of this study was to develop and analyze *Physalis peruviana* oil based NLC. The oil was extracted by hot soxhlation using n-hexane as the solvent and the extracted oil was utilized as an excipient (liquid lipid). Factorial design was adopted to optimize the amount of lipid blend (extracted oil and solid lipid), surfactant (Pluronic F-68) and sonication time to formulate NLC. The optimized formulations of fluconazole loaded NLC (PP-F-NLC) were evaluated by particle size, antifungal study, occlusion test, *in-vitro* skin permeation study and irritation test on animal skin. EE was found to be 99.96% and the optimized formulation showed 83% drug release in 24 hours. The formulated NLC showed better skin penetration, and potent antifungal activity against *Microsporum fulvum* as compared to marketed gel. It was concluded that the *Physalis peruviana* oil incorporated NLC is a promising formulation for fungal treatment and possesses high antioxidant potency. *Physalis peruviana* NLC can act as a potential carrier for anti-fungal/anti-inflammatory drugs to enhance the purported pharmacological activity against various problems.

INTRODUCTION

Excipients are an integral part of the drug delivery system. They play a major role in dosage forms such as, enhancing the dosage form volume, providing a pre-defined release (sustained/controlled/immediate), etc. A novel excipient is a substance which includes substances obtained through structural modification of an approved excipient (Swami, Gupta, Kymonil, & Saraf, 2010) and substance from a newer source, which has not been reported yet. Nanostructured lipid carriers (NLC) are colloidal lipid systems that have been projected for numerous administration routes like oral, topical etc. NLC are produced by blending solid and liquid lipid, thus forming nanostructures with superior properties of drug loading, drug release profile and stability. Upon topical application, NLC show occlusive behaviour, adhesiveness and skin hydration effect (Desai, Patlolla, & Singh, 2010).

Physalis peruviana L. is a semi-shrub, herbaceous plant, the fruit of which is a juicy berry with an ovoid shape, protected by calyx and possesses many important medicinal properties. The major components of fruits are

proteins, carbohydrates, lipids, vitamins, phytosterols, minerals, withanolides, physalins, etc (Puente, Pinto-Muñoz, Castro, & Cortés, 2011). *Physalis peruviana* oil can be extracted from whole berries, seed, pulp or peel of the fruit. Ramadan and Morsel (2003) reported the presence of 2% total lipid from whole berries, 1.8% from seed while 0.2% from pulp/peel. Most dominating lipid is linoleic acid. Oil also contains several other components such as β -carotene, vitamin K due to which it can be utilized for commercial purposes (M. F. Ramadan & Morsel, 2003). The current research envisages the utilization of *Physalis peruviana* oil as a novel excipient (liquid lipid). Fluconazole is taken as a model antifungal drug for evaluation parameters. The study mainly focuses on, whether the *Physalis peruviana* oil based nanostructured lipid carriers can be a good excipient-based approach for several biological problems.

MATERIALS AND METHOD

Physalis peruviana seeds and fluconazole were gifted from the Department of Horticulture, B.B.A. University,