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Screening of Formulation Components and Their Compatibility Study for Development of A Combinatorial Lipid Based Nanoformulation for Psoriasis

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ABSTRACT

Background: The global prevalence of psoriasis; which is affecting skin cells and immune cells in upto 11.43% of the global population; as well as due to its complex and dynamic pathophysiology; still possess a serious health concern. Conventionally, many therapies are available for the management of psoriasis. However, they have limited efficacy due to higher side effects and also no single topical agent is perfect in itself in the management of psoriasis. Therefore, combination therapy using lipid-based nanoformulation may be regarded as one of the most powerful strategies to obviate the compensatory mechanisms and dose-related undesired off-target effects. Further synergistic combinations of two or more therapeutically relevant molecules, acting through different mechanisms, maximize the therapeutic effect by providing a multi-target treatment approach.

Aim: The present work aims to screen liquid lipid, solid lipid and surfactants for development of dual drug-loaded lipidic nanoformulation of thymoquinone (TQ) and tacrolimus (TC) and to evaluate the compatibility between screened lipids, surfactants and drugs.

Methods: The solubility of both drugs TQ and TC in liquid lipids and solid lipids was done by adding an excess of drugs in lipids. The lipid showing maximum solubility for drugs are selected for formulation development. Further, the ratio of solid lipid to liquid lipidis was selected based on the miscibility study. The selection of surfactant and co-surfactant was done based on emulsification capacity determined by %transmittance. After that, compatibility between drugs and drug-excipients was done by UV, DSC and FTIR analysis.

Results: Based on maximum solubility Capryol 90 and Monostearin was selected as liquid lipid and solid lipid for formulation development. Based on miscibility study and maximum oil content, 6:4 ratio of Monostearin and Capryol 90 was selected. Further based on emulsification capacity Tween 80 and Span 20 was selected as surfactant and co-surfactant. After that, UV, DSC and FTIR analysis confirmed compatibility between drugs and excipients.

Conclusions: Screening of formulation components and compatibility study helps in better selection of excipients which leads to improved formulation stability, drug loading, particle size etc. which ultimately leads to improved psoriasis treatment.

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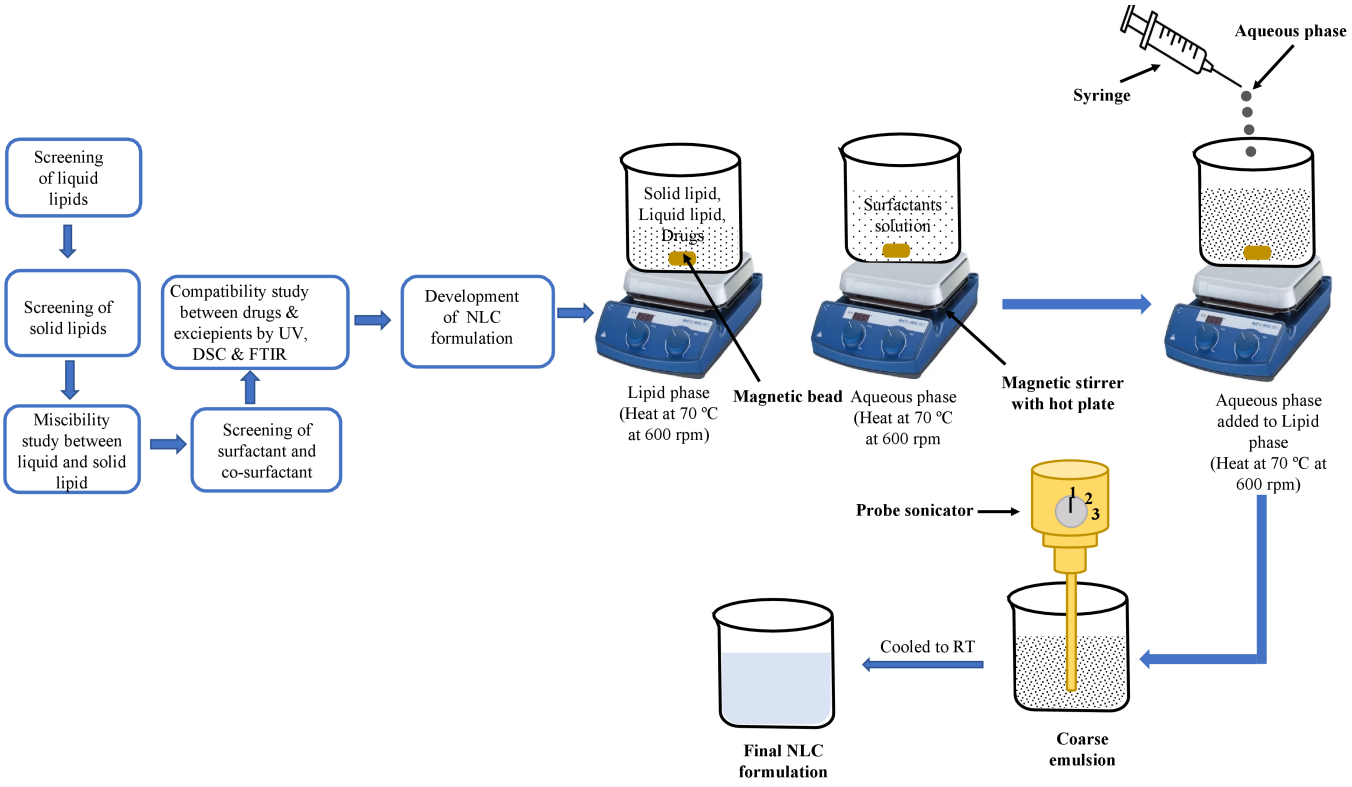
Screening of liquid lipids
Screening of solid lipids
Miscibility study between liquid and solid lipid
Screening of surfactant and co-surfactant
Compatibility study between drugs & exciepients by UV, DSC & FTIR
Development of NLC formulation
Solid lipid, Liquid lipid, Drugs
Lipid phase (Heat at 70 ºC at 600 rpm)
Magnetic bead
Surfactants solution
Aqueous phase (Heat at 70 ºC at 600 rpm
Magnetic stirrer with hot plate
Syringe
Aqueous phase
Aqueous phase added to Lipid phase (Heat at 70 ºC at 600 rpm)
Probe sonicator
1
2
3
Coarse emulsion
Cooled to RT
Final NLC formulation

Research

Journal of Phytochemistry

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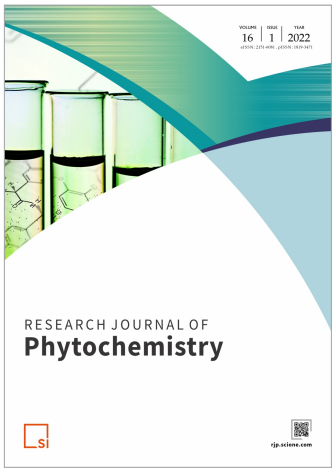

Aims & Scope

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