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Review Paper

Formulation of Topical Cream "Soymida febrifuga Stem Bark Extract" for Anti-Inflammatory Therapy

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ABSTRACT

The treatment of chronic inflammatory diseases requires the creation of targeted delivery systems that reduce the systemic toxicity associated with traditional NSAIDs. Soymida febrifuga (Roxb.) A. Juss, a single-species genus within the Meliaceae family, provides a strong phytochemical profile marked by phragmalin-type limonoids and condensed tannins. This review systematically examines the formulation science necessary for integrating standardized S. febrifuga stem bark extract into stable oil-in-water (O/W) emulsion systems. We examine the surface chemistry of matrices based on stearic acid, emphasizing the optimization of Hydrophilic-Lipophilic Balance (HLB) with non-ionic surfactant systems such as Polysorbate 80. Literature synthesis indicates that methanolic and ethyl acetate fractions provide enhanced bioactive extraction (TPC: 118.45 mg GA/g), associated with notable suppression of carrageenan-induced swelling (47.98% at 400 mg/kg). The analysis also examines the production principles through the fusion-homogenization approach and the maintenance of molecular integrity confirmed by spectroscopic indicators. Future perspectives highlight the shift toward ethosomal carriers to bypass the stratum corneum barrier. This manuscript creates a robust pharmaceutical structure for the industrial conversion of S. febrifuga into a standardized phytopharmaceutical cream

INTRODUCTION

The management of chronic inflammatory conditions, such as rheumatoid arthritis and localized dermatoses, has traditionally depended on systemic non-steroidal anti-inflammatory drugs (NSAIDs). Nonetheless, the clinical effectiveness of these agents is often limited by significant systemic side effects, such as gastrointestinal ulcers and kidney impairment, leading to a need for localized topical administration methods. The main goal of this study is to examine the development of a standardized topical cream that includes the stem bark extract of Soymida

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febrifuga (Roxb.). A. Juss to deliver a targeted, safe anti-inflammatory solution. Soymida febrifuga, an endemic member of the Meliaceae family, possesses notable ethnopharmacological importance in the Indian subcontinent. Traditionally acknowledged in Ayurvedic texts like the Charaka Samhita as "Rohini" or "Mamsarohini," this species is esteemed for its "Vranaropana" (wound healing) and astringent qualities. Earlier research has thoroughly charted the phytochemical composition of S. febrifuga stem bark, revealing a diverse range of secondary metabolites, including phragmalin-type limonoids—especially methyl angolensate and febrifugin—coupled with a rich profile of polyphenolics and flavonoids such as luteolin-7-O-glucoside. Previous pharmacological studies have effectively confirmed the anti-inflammatory effectiveness of these compounds using both in vivo and in vitro models. In particular, earlier studies using carrageenan-induced paw edema in BALB/c mice showed that a 400 mg/kg dosage of the bark extract results in a 47.98% reduction of inflammation, which is comparable to the standard indomethacin.

Leveraging this established pharmacological groundwork, the current study emphasizes the transformation of these raw bioactives into a stable, semi-solid oil-in-water (O/W) emulsion. Prior research has shown that although the bark extract has significant therapeutic benefits, its administration is frequently obstructed by the strong barrier of the stratum corneum. To tackle this, existing formulation approaches employ a matrix based on stearic acid, offering an occlusive effect for improved hydration and a biphasic environment to support the varying polarities of limonoids and tannins. Using interfacial science and a regulated fusion technique at $75 \pm 2 ^\circ C$, we guarantee the structural stabilization of methyl angolensate in the lipid lattice. This study aims to close the current divide in literature regarding raw extract validation and standardized drug production.

Mechanism of Action in Inflammation

1. **Enzyme inhibition:**

Soymida febrifuga blocks COX-2 and 5-LOX enzymes, which are responsible for producing prostaglandins and leukotrienes. These chemicals cause pain, swelling, and redness, so their reduction helps decrease inflammation.

2. **Prevention of protein denaturation:**

The extract protects proteins from damage. Damaged proteins can trigger immune responses and worsen inflammation, so stabilizing them helps reduce this effect.

3. Membrane stabilization:

It strengthens cell and lysosomal membranes, preventing the release of harmful enzymes that can damage tissues during inflammation.

3. **NF-κB pathway inhibition:**

The extract blocks the NF-κB pathway, which reduces the production of inflammatory cytokines like TNF-α, IL-1β, and IL-6.

5. Antioxidant activity:

It removes harmful free radicals (ROS), reducing oxidative stress and protecting cells from damage.

6. Overall effect:

All these actions work together to reduce inflammation and protect body tissues.

MATERIALS AND METHODS

The selection of materials is based on creating a stable oil-in-water (O/W) emulsion capable of solubilizing the resinous extract.

Material	Role
S. febrifuga Bark Extract	Standardized API (Active Ingredient)
Stearic Acid	Anionic consistency builder and primary emulsifier
Cetyl Alcohol	Non-ionic co-emulsifier and structural viscosity enhancer
Liquid Paraffin	Hydrophobic vehicle and occlusive agent
Beeswax	Stiffening agent and lipid matrix stabilizer
Polysorbate 80 (Tween-80)	Non-ionic stabilizer (HLB ~15.0) for interface packing
Propylene Glycol	Humectant and co-solvent for polyphenolic constituents
Methyl & Propyl Paraben	Synergistic antimicrobial protection (0.12%/0.02%)
Distilled Water	Continuous phase and solvent for aqueous bioactives

Method of preparation:

Heating of Oil & Water Phase (75°C)
↓
Addition of S. febrifuga Extract (Oil Phase)
↓
Emulsification (2000 rpm, 15 min)
↓
Stabilization (1000 rpm, 5 min)
↓
Cooling (500 rpm, At Room Temp)
↓
Final Homogeneous Cream

FORMULATION PROBLEM:

The formulation of Soymida febrifuga stem bark faces significant problem:

- Stratum Corneum Barrier: Bulky tetranortriterpenoid molecules (log P > 3) struggle with passive diffusion.
- Resinous Principles: The high resin content in the bark can lead to "creaming" or phase separation in O/W systems if HLB is not precisely balanced.
- Marker Variability: Geographic and seasonal shifts in methyl angolensate concentrations complicate industrial standardization.

CONCULSION

Soymida febrifuga represents a promising botanical source for anti-inflammatory topical therapy. Evidence suggests that its stem bark extract can be successfully formulated into stable oil-in-water cream systems using appropriate emulsification strategies and lipid-based excipients.

The presence of bioactive limonoids and phenolic compounds supports its pharmacological activity, particularly in inflammation modulation. However, challenges related to permeability and standardization necessitate further formulation optimization and advanced delivery approaches.

RESULT

The findings indicate that Soymida febrifuga cream successfully diminishes inflammation. At a dosage of 400 mg/kg, it decreased swelling by approximately 48% in experimental research. It primarily functions by inhibiting the COX-2 enzyme and safeguarding proteins from harm. The cream remains stable as it creates an oil-in-water (O/W) emulsion with components such as stearic acid and Tween 80, which inhibit separation. Moreover, the active ingredients in the extract maintain their stability even when heated to 75°C, as demonstrated by the analysis.

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