

## HERBAL EMULGELS: A PROMISING FRONTIER IN TOPICAL DRUG DELIVERY - A CRITICAL REVIEW

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### ABSTRACT

Topical drug delivery presents a significant challenge due to the skin's natural barrier system, limiting the permeation and absorption of hydrophobic drugs. Herbal remedies, historically used in treating various ailments including skin conditions, face similar limitations due to their hydrophobic nature. To address these challenges, scientists have turned to innovative drug delivery systems like emulgels, which effectively carry hydrophobic drug molecules. Emulgels, a combination of emulsion and gel, offer several advantages such as enhanced drug absorption, easy application and removal, emollient properties, non-greasy texture, cosmetic appeal, and efficient penetration. This review underscores the significance of emulgels in delivering herbal extracts/constituents, discusses formulation methods, and provides an overview of herbal emulgel formulations explored by researchers. Emulgels emerge as promising vehicles for enhancing the topical delivery of herbal remedies, thereby improving the management of skin infections and other dermatological conditions.

**Keywords:** Topical Drug Delivery, Skin's Natural Barrier System, Hydrophobic Nature, Emulgels, Emollient Properties, Herbal Extracts/Constituents, Skin Infections, Dermatological Conditions.

### I. INTRODUCTION

Topical drug delivery is an essential avenue in pharmaceutical research, offering targeted treatment for various dermatological conditions. However, the skin's intricate barrier system poses a formidable challenge, hindering the effective permeation and absorption of hydrophobic drugs. Similarly, herbal remedies, renowned for their therapeutic potential in treating diverse ailments, encounter similar limitations due to their inherent hydrophobic nature. In response to these challenges, researchers have increasingly turned to innovative drug delivery systems, such as emulgels, to overcome these barriers and enhance therapeutic outcomes.

Emulgels represent a promising convergence of emulsion and gel technologies, offering a versatile platform for delivering hydrophobic drug molecules across the skin barrier. These formulations present several advantages, including enhanced drug absorption, ease of application and removal, emollient properties, non-greasy texture, and cosmetic appeal. Their ability to efficiently penetrate the skin makes them particularly suitable for delivering herbal extracts and constituents, thereby expanding the therapeutic potential of herbal remedies in dermatological applications.



**Fig:** Emulgel

**Table:** Ingredients used in herbal emulgel with their uses.

Sr. No.	Ingredients	Uses
1	Aloe vera	Known for its soothing and moisturizing properties, aloe vera is often included in emulgels to provide relief for irritated or inflamed skin conditions such as sunburn, eczema, and psoriasis.
2	Turmeric	With its anti-inflammatory and antioxidant properties, turmeric is used in emulgels to reduce inflammation, promote wound healing,

		and improve skin complexion.
3	Neem	Neem is valued for its antibacterial, antifungal, and antiviral properties, making it a common ingredient in emulgels for treating acne, fungal infections, and other skin disorders.
4	Calendula	Calendula is renowned for its wound-healing properties and is often incorporated into emulgels to soothe and heal minor cuts, burns, and abrasions.
5	Chamomile	Chamomile possesses anti-inflammatory and calming effects, making it suitable for inclusion in emulgels to relieve itching, redness, and irritation associated with various skin conditions, including eczema and dermatitis.
6	Lavender	Lavender oil is prized for its antiseptic and anti-inflammatory properties, making it a popular choice for emulgels targeting acne, insect bites, and minor skin irritations.
7	Tea tree oil	With its potent antimicrobial properties, tea tree oil is often added to emulgels to treat acne, fungal infections, and other skin disorders caused by bacteria or fungi.
8	Rosemary	Rosemary extract has antioxidant and antimicrobial properties, making it beneficial for use in emulgels to protect the skin from environmental damage and prevent microbial infections.
9	Green tea	Green tea extract is rich in antioxidants, making it a valuable ingredient in emulgels for anti-aging and skin rejuvenation purposes.
10	Ginseng	Ginseng extract is known for its revitalizing and toning effects on the skin, making it a popular ingredient in emulgels for improving skin elasticity and firmness.

**Advantages of Herbal Emulgels:**

1. Enhanced drug absorption through the skin barrier.
2. Ease of application and removal, improving patient compliance.
3. Emollient properties provide hydration and skin softening.
4. Non-greasy texture and cosmetic appeal.
5. Ability to solubilize hydrophobic herbal ingredients for effective delivery.
6. Potential for targeted delivery and localized therapeutic effects.

**Disadvantages of Herbal Emulgels:**

1. Limited stability, particularly with certain herbal extracts.
2. Risk of skin irritation or allergic reactions to herbal ingredients.
3. Challenges in standardizing herbal content and potency.
4. Potential for interactions between herbal ingredients and other drugs.
5. Regulatory hurdles in some regions due to the complex nature of herbal formulations.
6. Costlier compared to conventional topical formulations.

**II. METHOD OF PREPARATION FOR HERBAL EMULGELS**

1. **Selection of Ingredients:** Choose suitable herbal extracts or active ingredients based on the desired therapeutic effects. Ensure the compatibility and stability of chosen ingredients in the emulgel formulation.

2. **Preparation of Herbal Extracts:** Extract herbal materials using appropriate extraction methods such as maceration, percolation, or Soxhlet extraction. Filter the extracts to remove any solid particles or impurities.
3. **Preparation of Emulsion:** Prepare the oil phase by mixing the lipophilic components such as oils, waxes, and lipophilic active ingredients. Heat the oil phase to dissolve any solid components. Prepare the aqueous phase by dissolving hydrophilic components such as water-soluble active ingredients, humectants, and preservatives in water or an aqueous solution.
4. **Emulsification:** Heat both the oil and aqueous phases separately to the same temperature and then slowly add the aqueous phase to the oil phase with continuous stirring or homogenization. This forms the emulsion.
5. **Gelling Agent Addition:** Once the emulsion is formed, add the gelling agent (e.g., carbomer, xanthan gum) to the emulsion while stirring continuously until the desired viscosity is achieved.
6. **Incorporation of Herbal Extracts:** Add the herbal extracts or active ingredients to the emulsion-gel base and mix thoroughly until uniform dispersion is achieved.
7. **Adjustment of pH and Viscosity:** Adjust the pH of the emulgel formulation using suitable buffering agents if necessary. Adjust the viscosity by adding more gelling agent or water to achieve the desired consistency.
8. **Preservative Addition:** Incorporate preservatives to prevent microbial growth and extend the shelf life of the emulgel formulation. Mix thoroughly to ensure even distribution.
9. **Packaging and Storage:** Transfer the finished emulgel formulation into suitable packaging containers and store in a cool, dry place away from direct sunlight.

### III. EVALUTION TESTS OF HERBAL EMULGEL

Several evaluation tests are commonly performed to assess the quality, stability, and performance of herbal emulgels. These tests include:

1. **Physical Appearance:** Visual inspection for color, odor, and homogeneity to ensure uniformity and absence of any physical defects.
2. **pH Measurement:** Determine the pH of the emulgel formulation to ensure it falls within the appropriate range for skin compatibility and stability.
3. **Viscosity:** Measure the viscosity of the emulgel using a viscometer to ensure it has the desired consistency for easy application and spreadability.
4. **Spreadability:** Evaluate the spreadability of the emulgel on the skin surface using a suitable method such as the slide method or the two-plate method.
5. **Globule Size and Distribution:** Analyze the globule size and distribution of the emulsion phase using techniques such as dynamic light scattering (DLS) or microscopy to ensure uniformity and stability of the formulation.
6. **Drug Content:** Determine the content of active herbal ingredients in the emulgel formulation using validated analytical methods such as high-performance liquid chromatography (HPLC) or ultraviolet-visible (UV-Vis) spectroscopy.
7. **Drug Release Studies:** Conduct in vitro drug release studies to evaluate the release kinetics of the active ingredients from the emulgel formulation using appropriate diffusion cells and sink conditions.
8. **Stability Studies:** Perform stability studies under various storage conditions (e.g., temperature, humidity) to assess the physical, chemical, and microbiological stability of the emulgel formulation over time.
9. **Skin Irritation and Sensitization:** Conduct skin irritation and sensitization tests using appropriate in vitro or in vivo models to assess the potential irritancy or sensitization of the emulgel formulation on the skin.
10. **Microbiological Analysis:** Perform microbiological tests to assess the microbial load and ensure the absence of microbial contamination in the emulgel formulation.
11. **Compatibility Studies:** Evaluate the compatibility of the emulgel formulation with packaging materials to ensure compatibility and prevent leaching or interaction between the formulation and packaging components.

### IV. CONCLUSION

Herbal emulgels represent a promising approach for enhancing the topical delivery of herbal remedies, overcoming the challenges associated with skin barrier permeation and absorption of hydrophobic drugs.

These formulations offer several advantages, including enhanced drug absorption, ease of application, emollient properties, and cosmetic appeal. Through this review, we have highlighted the significance of emulgels in delivering herbal extracts/constituents, discussed formulation methods, and provided an overview of herbal emulgel formulations explored by researchers. Emulgels emerge as promising vehicles for improving the management of skin infections and other dermatological conditions, offering a synergistic combination of traditional herbal medicine and modern pharmaceutical science. Further research and development in this area hold great potential for advancing dermatological therapy and improving patient outcomes.

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