INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

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Mini Review Article

Phytosomal Gel a Comprehensive Review of Its Applications and Benefits

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ARTICLE INFO

Published: 15 Mar. 2025
Keywords:
Phytosomal gels, bioavailability, advantage, technology.
DOI:
10.5281/zenodo.15031206

ABSTRACT

Phytosomal gels have gained significant attention in the field of pharmaceutical and cosmetic sciences due to their enhanced bioavailability, stability, and targeted delivery. The concept of phytosomes involves the encapsulation of plant-based active compounds in lipid-based vesicles, providing an efficient means of delivery. This review article aims to provide a comprehensive overview of phytosomal gels, including their mechanism of action, formulation methods, advantages, applications, and limitations. The increasing demand for natural remedies, coupled with the growing interest in enhancing the bioavailability of herbal compounds, makes phytosomal gels a promising technology. In addition, the article will address the future prospects of phytosomal gels in modern therapeutics.

INTRODUCTION

1.1 Background

Phytosomal gels are an innovative formulation that combines herbal extracts with phospholipids to enhance the delivery of active compounds. The unique structure of phytosomes enhances the solubility, stability, and absorption of the herbal components, leading to improved therapeutic efficacy. In the past few decades, there has been a significant shift toward using natural products for health care, with the desire to formulate safer alternatives to synthetic drugs. Phytosomes provide an ideal solution for enhancing the bioavailability of bioactive compounds derived from plants, making them a popular choice in both pharmaceutical and cosmetic industries [1-2].

2. Mechanism of Action [3]

2.1 Phytosome Technology

Phytosomes are phospholipid complexes in which the active plant ingredient is encapsulated by phospholipids such as phosphatidylcholine. This process improves the solubility of otherwise poorly water-soluble plant compounds and enhances their systemic absorption. The plant bioactive molecules bind to the phospholipid

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

bilayer, forming a stable structure that mimics the properties of natural cell membranes.

2.2 Bioavailability Enhancement

The primary challenge with many herbal extracts is their low bioavailability. The encapsulation of these compounds within a phospholipid complex improves their solubility, stability, and permeability across cellular membranes, leading to enhanced bioavailability. This is particularly important for compounds such as flavonoids, alkaloids, and polyphenols, which are often poorly absorbed by the gastrointestinal tract.

3. Preparation Methods of Phytosomal Gels [4]

3.1 Preparation of Phytosome Complexes

The preparation of phytosome complexes involves several methods, such as the solvent evaporation method, co-precipitation method, and the thin-film hydration method. Among these, the thin-film hydration method is the most commonly used for the preparation of phytosome complexes. The process involves dissolving the plant extract and phospholipid in an organic solvent, followed by the removal of the solvent, and hydration of the film formed to encapsulate the active ingredients.

3.2 Incorporation into Gels

Phytosomal complexes are typically incorporated into gels to enhance topical delivery. The gel formulation ensures better skin penetration and controlled release of the active compounds. Gels are typically prepared by dispersing the phytosome complexes in a gel base, which may consist of gelling agents like carbopol, hydroxyethylcellulose, or xanthan gum.

4. Applications of Phytosomal Gels [5]

4.1 Pharmaceutical Applications

Phytosomal gels have shown promise in the delivery of various therapeutic agents, especially those derived from medicinal plants. Some of the key phytosomal gel formulations in the pharmaceutical industry include gels containing:

- **Curcumin:** Known for its anti-inflammatory and antioxidant properties.
- **Ginkgo Biloba:** Used for enhancing cognitive function and improving circulation.
- **Milk Thistle:** A potent liver detoxifier.
- **Boswellia serrata:** Effective in treating conditions such as arthritis and inflammation.

4.2 Cosmetic Applications

In the cosmetic industry, phytosomal gels are being utilized for:

- **Anti-aging treatments:** Phytosomes containing antioxidants such as polyphenols from green tea, grape seed extract, and Vitamin E.
- **Skin whitening:** Herbal formulations that incorporate ingredients like licorice extract or arbutin, which are known for their skin-brightening effects.
- **Wound healing:** Phytosomal gels containing aloe vera and calendula extract are often used for skin regeneration.

4.3 Dermatological Applications

Phytosomal gels are also popular in dermatology, where they are used to treat conditions like acne, eczema, psoriasis, and fungal infections. Phytosome-based gels enhance the penetration of active ingredients like tea tree oil, salicylic acid, and neem oil, leading to better therapeutic outcomes.

5. Advantages of Phytosomal Gels [6]

5.1 Enhanced Bioavailability

The encapsulation of herbal compounds in phospholipid complexes significantly improves their bioavailability, as discussed earlier. This is crucial for compounds with low aqueous solubility and poor absorption, ensuring that therapeutic concentrations can be achieved in the body.

5.2 Stability

Phytosomal gels offer superior stability compared to conventional herbal formulations. The encapsulation process protects the active ingredients from degradation caused by environmental factors such as light, oxygen, and temperature.

5.3 Targeted Delivery

Phytosomal gels offer targeted delivery, particularly in topical applications. The ability to control the release of active ingredients over time leads to improved therapeutic outcomes and reduced side effects.

6. Limitations and Challenges [7]

6.1 Production Cost

The production of phytosomal gels can be expensive due to the complex preparation methods and the use of high-quality phospholipids. This may limit their widespread use in certain markets.

6.2 Stability Issues in Formulation

Although phytosomal gels provide enhanced stability for plant extracts, the stability of the gel itself may be affected by factors such as pH, temperature, and ionic strength. This can sometimes result in precipitation or degradation of the active compounds.

6.3 Regulatory Hurdles

As phytosomal gels often contain natural products, there can be challenges in terms of regulation, especially in the pharmaceutical industry. The standards for the quality and safety of herbal formulations are not always as stringent as those for synthetic drugs, which could lead to concerns over the consistency and safety of products.

7. CONCLUSION

Phytosomal gels represent a promising advancement in the delivery of herbal therapeutics and cosmetics. Their ability to enhance the bioavailability and stability of active compounds makes them highly effective in both oral and topical formulations. While challenges remain in terms of cost and stability, the potential benefits of phytosomal gel formulations make them a key area of research for future therapeutic and cosmetic applications. Further advancements in technology and formulation techniques will likely address these challenges, increasing the accessibility and effectiveness of phytosomal gels in the coming years.

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HOW TO CITE: Muskan, Dr. Eisha Ganju*, Bhaskar Kumar Gupta, Phytosomal Gel a Comprehensive Review of Its Applications and Benefits, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 3, 1384-1387. https://doi.org/10.5281/zenodo.15031206