

Formulation and Evaluation of Polyherbal Gel Containing Liquorice Extract

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Abstract—The present study focuses on the formulation and evaluation of a polyherbal gel containing liquorice (*Glycyrrhiza glabra*) extract for topical application. Carbopol 940 was used as the gelling agent along with butylene glycol, sorbitol, sodium phytate, benzyl alcohol, triethanolamine, and purified water as formulation excipients. The UV-visible spectroscopy and FTIR analysis confirmed the presence of active phytoconstituents and compatibility of formulation components. Among the prepared formulations, F2 showed optimum characteristics with better spread ability, stability, viscosity, and enhanced drug release. The results suggest that the developed polyherbal gel is suitable for topical application and possesses promising therapeutic potential.

Index Terms—Liquorice extract, Polyherbal gel, Carbopol 940, FTIR, UV-visible spectroscopy, Topical formulation.

I. INTRODUCTION

Herbal drug delivery systems have become increasingly popular in recent years due to their therapeutic effectiveness, lower toxicity, and improved patient acceptability. Among various topical dosage forms, gels are widely preferred because of their ease of application, better spread ability, non-greasy nature, and enhanced patient compliance. Topical herbal gels provide localized action at the site of application and reduce systemic side effects commonly associated with oral therapy. Liquorice (*Glycyrrhiza glabra*) is a traditional medicinal plant extensively used in herbal medicine for its anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties. The plant contains several active phytoconstituents such as glycyrrhizin, liquiritin, flavonoids, and saponins which contribute

to its pharmacological activities. Due to these therapeutic properties, liquorice extract is considered beneficial in the management of inflammatory skin disorders including eczema.

Eczema is a chronic dermatological condition characterized by redness, itching, irritation, dryness, and inflammation of the skin. Long-term use of synthetic corticosteroids and other conventional topical agents may produce undesirable side effects, thereby increasing the demand for safer herbal alternatives.

II. MATERIALS USED AND METHODS

A. Materials Used

The materials used in the present study included Liquorice (*Glycyrrhiza glabra*) extract, Carbopol 940, butylene glycol, sorbitol, sodium phytate, benzyl alcohol, triethanolamine, and purified water. All chemicals and reagents used were of analytical grade and obtained from suitable pharmaceutical sources.

Table 1: Formulation Table of Anti Eczema Gel

Sr. No	Ingredients	Quantity
1	Liquorice Extract	0.2 ml
2	Carbopol 940	0.1 g
3	Butylene Glycol	0.5 mL
4	Sorbitol	0.3 mL
5	Sodium phytate	0.01 g
6	Benzyl alcohol	0.05 mL
7	Triethanolamine	Qs
8	Purified Water	q.s to 10 gm
9	Coloring Agent	q.s



Figure 1: Prepared Polyherbal Antieczema Gel

B. Method of Preparation

Carbopol 940 was slowly dispersed in purified water with continuous stirring to avoid lump formation and kept aside for complete hydration. In another beaker, liquorice extract, butylene glycol, sorbitol, sodium phytate, and benzyl alcohol were mixed properly. The prepared mixture was then added gradually to the hydrated Carbopol base under constant stirring. Triethanolamine was added dropwise to adjust the pH.

III. PHYSICAL APPEARANCE AND HOMOGENEITY

The prepared polyherbal gel was evaluated visually for its colour, appearance, texture, and homogeneity. The gel showed a smooth texture with uniform consistency and was free from lumps or grittiness. The formulation appeared translucent with good aesthetic properties suitable for topical application.

1. pH Determination

Approximately 1 g of the prepared gel was dispersed in 10 mL of distilled water and mixed thoroughly. The pH of the formulation was measured using a calibrated digital pH meter. The obtained pH was found to be within the acceptable range for topical skin preparations.

2. Viscosity Measurement

The viscosity of the prepared gel was determined using a Brookfield viscometer at room temperature. The formulation exhibited satisfactory viscosity, indicating good consistency and ease of application on the skin.

3. Spread ability Test

Spread ability of the gel was evaluated by placing the formulation between two glass slides and applying a certain weight over them. The gel showed good spread ability, ensuring uniform application over the affected skin area.

4. Skin Irritation Test

The skin irritation study was carried out by applying a small quantity of gel on the skin surface and observing for redness, itching, or irritation after 24 hours. No signs of irritation or inflammation were observed, indicating that the formulation to be safe.

5. Permeability Study

The permeability study of the gel formulation was performed to evaluate the release behavior of the active constituents through the gel matrix. The formulation demonstrated satisfactory permeability characteristics suitable for topical delivery.

IV. RESULTS AND DISCUSSION

Physical Appearance and Homogeneity

The developed polyherbal anti-eczema gel was found to be smooth, translucent, and homogeneous in appearance. The formulation possessed good consistency without the presence of lumps or grittiness. The gel exhibited satisfactory texture and was suitable for topical application.

4.1 pH Determination

The pH of the prepared gel was found to be within the acceptable range for skin application. The formulation showed a skin-compatible pH, indicating reduced chances of irritation and better patient acceptability during topical administration.

Table 2: pH determination of prepared gel

Parameter	Observation
pH	5.6

4.2 Viscosity Measurement

The prepared gel exhibited moderate viscosity with good consistency. Appropriate viscosity helps in easy application and enhances the stability of the formulation. The gel remained stable without phase separation during the observation period

Table 3: Viscosity Determination of prepared gel

Parameter	Observation
Viscosity	Moderate

4.3 Spread ability Test

The formulation showed satisfactory spread ability, allowing uniform distribution of the gel over the skin surface. Good spread ability ensures better patient compliance and ease of topical application.

Parameter	Observation
Spread ability	17.2 g.cm/sec

4.4 Skin Irritation Test

No redness, itching, swelling, or irritation was observed after topical application of the gel. The formulation was found to be non-irritant.

Parameter	Observation
Skin Irritation	No Irritation observed

4.5 Permeability Study

The permeability study indicated satisfactory release characteristics of the active herbal constituents from the gel matrix. The formulation demonstrated suitable permeability properties for effective topical delivery.

Parameter	Observation
Permeability	High

V. DISCUSSION

The developed anti-eczema herbal gel showed acceptable formulation characteristics during evaluation studies. The prepared gel possessed a clear and elegant appearance with a soft texture that was appropriate for topical administration. The formulation remained stable throughout the observation period and did not show any signs of separation or grittiness.

The observed pH value was found to be suitable for skin application and may help in reducing the possibility of irritation after topical use. The gel demonstrated satisfactory consistency and was easily applicable over the skin surface due to its good spreading nature. Proper viscosity of the formulation helped maintain better retention at the site of application. No adverse reactions such as redness, burning sensation, or itching were noticed during the skin irritation study, indicating good compatibility of the formulation with the skin.

VI. CONCLUSION

An herbal anti-eczema gel containing liquorice extract was prepared successfully by using suitable gelling agents and excipients. The formulation was evaluated for different parameters and showed satisfactory results with respect to appearance, homogeneity, pH, viscosity, spread ability, and skin compatibility.

The prepared gel was found to be stable, easy to apply, and non-irritant in nature. Based on the obtained evaluation results, the formulation may be considered a promising herbal preparation for topical use in eczema and other minor inflammatory skin conditions. Further clinical and stability investigations may help in establishing its therapeutic effectiveness.

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