

A Review on Herbal Gels

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Date of Submission: 01-10-2026

Date of Acceptance: 11-10-2026

ABSTRACT

In this review the study of the traditional plants which are using of prepare herbal gels for multipurpose. Herbal medicines are still the mainstay of about 75-80% of the world's population, mainly of developing countries, for primary health care due to better cultural acceptability, better compatibility with human body and lesser side effects.

Herbal medicines consist of plant or its part to treat injuries, disease or illnesses and are used to prevent and treat diseases and ailments or to promote health and healing. Herbal medicines are the oldest form of healthcare known to mankind. From that the Herbal Gel is used topically for treating many disorders. By the extraction of plant herb formulate the herbal gel with adding some components such as Carbopol 934, HPMCK 100 Mand Xanthan gum showed good homogeneity, no skin irritation, good stability and anti-inflammatory activity. The extract shows best and promising activity. Now a day's topical agents are widely used to treat skin conditions.

I. INTRODUCTION TO HERBAL GEL FORMULATIONS:

Herbal cosmetics are preparations that contain phytochemicals from different botanical sources that enhance skin functions and nutrients that are beneficial to the skin and overall wellness. The use of herbs, plant extracts, and natural products in cosmetics has increased due to the high awareness of the adverse effects of some artificial compounds. Herbal formulations are becoming more popular and safe sources of drugs^[1]. Among

topical preparations, gels are preferred for localized drug administration and percutaneous absorption due to their easy application, prolonged contact with the skin, good spread ability and reduced side effects. Medicinal plants have been used for centuries in herbal medicine, and a large percentage of the world's population still relies on plants and herbal preparations for the treatment of various diseases. Different parts of medicinal plants, for example, leaves, roots, stems, fruits, seeds, and bark, contain diverse phytochemical compounds with pharmacological activities^[2]. For example, they have anti-inflammatory, antimicrobial, anti-ulcer, antidiabetic, wound-healing, and anti-arthritis properties among other health benefits. Phytochemicals can be extracted using maceration, Soxhlet extraction, percolation, and distillation methods depending on the type of active constituent. Herbal gels prepared from medicinal plants such as Cynodondactylon, Punica granatum, Thymus vulgaris, and Vitex negundo have been tested for different therapeutic applications^[3].

For example, Cynodondactylon (family Poaceae) has been reported to have several medicinal properties including anti-inflammatory and anti-ulcer activities. Therefore, herbal gel formulation using extracts obtained by appropriate extraction techniques such as Soxhlet extraction can be a good strategy for topical treatment of inflammatory conditions and other diseases using the phytochemical compounds^[4].

IDEAL PROPERTIES OF TOPICAL GELS [5]:

- The gel to be uniform and transparent.
- Application of shear or force in the during shaking of the container, the gel should break easily.
- The gel should have an inert composition.
- The gel must not be sticky.
- The gel shouldn't ever contact with another component in the formulation.
- The gel must be reliable.
- The skin or any area where the gel is placed shouldn't be irritated.
- The gel should be inert in nature.
- The gel should be non-sticky.
- The gel should not interact with any other formulation component
- The gel should be clear and homogenous.
- The gel should be stable.
- The viscosity is should be optimum.
- It should have anti- microbial activity.

Classification of Gels (Types of Gels):

Gels are semifluid colloidal suspensions that can be classified on the basis of colloidal phases, nature of solvent, physical nature, and rheological properties.

1.Classification Based on Colloidal Phases

- Inorganic gels (two-phase): These consist of minute inorganic particles dispersed homogeneously throughout the gel like material. The gels are predominantly thixotropic. Examples are Aluminium Hydroxide Gel and bentonite magma.
- Organic gels (single-phase): These consist of large organic molecules dispersed in a continuous medium. Examples are Carbopol and tragacanth gels.

2.Classification Based on Nature of Solvent

Present

- Hydrogels: These are water containing gels with hydrophilic polymers. Examples are sodium alginate, pectin and tragacanth gels.

- Organ gels: These are gels where the liquid medium is a non-aqueous organic solvent. An example is lecithin organ gels.
- Xerogels: These are solid gels formed by drying process. Examples are dry cellulose and polystyrene.

3.Classification Based on Physical Nature

- Elastic gels: These are flexible gels formed by physical interactions like hydrogen bond. Examples are agar, pectin, guar gum and alginate gels.
- Rigid gels: These are strong gels where primary bonds hold the system together. An example is silica gel

4.Classification Based on Rheological Properties

- Gels can further be classified into plastic, pseudoplastic and thixotropic gels^[7,8].

1. ADVANTAGES OF GEL FORMULATIONS

- Gel formulation has some main advantages over other semisolid dosage forms.
- Gel formulation is effortless to prepare compared to other formulations.
- Gel is elegant non-greasy formulation.
- Gel has excellent adherence property to application site.
- Gel is biocompatible and eco-friendly.
- It Has magnificent tolerability to stress conditions^[8,9]

2. DISADVANTAGES OF GEL FORMULATION

- Despite several advantages. formulations also have some disadvantages.
- The gelators or the additives may irritate. An increase in water content creates a possibility of attack by fungi or microorganisms on the gel.
- Loss of solvent from the formulation will dry of the gel.
- Flocculation in some gel leads to an unstable gel. Effect of gels is relatively sustained and slower.1. The gel should be stable^[10,11].

PHYSICOCHEMICAL AND DERMATOLOGICAL EVALUATION TESTS:

Table1: EVALUTION TESTS FOR HERBAL GELS

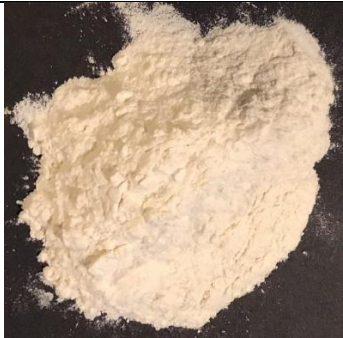
S.NO	EVALUTION TESTS	METHOD/INSTUMENTATION	Acceptance Criteria / Standard Values
1.	Organoleptic Tests	Visual assessment under light against black and white backgrounds to evaluate colour, transparency, and freedom from particulate matter.	Clear, uniform appearance with no phase separation or contamination.
2	pH Determination	Measures hydrogen ion concentration	Skin-compatible range:

		to verify dermal/mucosal compatibility and minimize tissue irritation.	4.5 to 6.5.
3.	Viscosity & Flow Behaviour	Assesses non-Newtonian flow, shear-thinning (pseudoplastic) behaviour, and structural recovery (thixotropy) using a rotational viscometer or rheometer.	Within designated centipoise (cP) or Pa·s range per formula; exhibits shear-thinning under stress.
4.	Drug Content & Assay	Quantifies active pharmaceutical ingredient (API) concentration using HPLC or UV-Vis spectrophotometry to verify potency.	90.0% – 110.0% of label claim across batch samples.
5.	Related Substances / Impurities	Detects degradation products, residual solvents, and synthetic impurities formed during formulation or storage via chromatographic methods.	Meets ICH threshold limits depending on daily dose).
6.	Primary Dermal Irritation	Assesses skin tolerance (erythema and oedema formation) using animal models or human patch tests.	Primary Irritation Index (PII) score ≤ 2.0 (Non-irritant to mildly non-irritant).
7.	Extrudability	Measures the empirical weight/force required to extrude gel ribbon from a collapsible container tube.	High percentage extruded cleanly under standard applied load.
8.	Spreadability	Quantifies ease of spreading over application site calculated using parallel glass slides	Expressed in g. cm / s; higher values indicate better skin application ^[12-18]

II. MATERIALS AND METHODS:

TABLE2: MATERIALS FOR HERBAL GELS

S.NO	INGREDIENTS	USES
1	Aloe Vera 	- Cools sunburns and speeds up skin healing. - Hydrates dry skin without leaving a greasy residue. - Reduces acne redness and calms skin irritation. - Soothes itchy scalp, reduces dandruff, and adds hair shine. - Relieves constipation and calms heartburn when taken as juice.
2	Gum Tragacanth	- Cools the body and acts as a natural summertime cooler in traditional drinks. - Relieves constipation by adding bulk to stools as a gentle natural laxative. - Soothes mouth ulcers, sore throats, and digestive tract inflammation. - Acts as a natural stabilizer, thickener, and binding agent in food and pharmaceuticals.

		Hydrates skin, smooths wrinkles, and conditions hair in cosmetic formulations.
3	Gum Acacia (Arabic) 	- Acts as a powerful natural prebiotic to support healthy gut bacteria. - Relieves digestive issues, bowel irregularity, and mild constipation. - Promotes fullness and aids in weight management and appetite control. - Soothes sore throats, calms coughing, and reduces oral mucosal irritation. - Serves as a versatile emulsifier, stabilizer, and binder in foods, drinks, and pharmaceuticals.
4	Tamarind Seed Gum 	- Acts as a natural thickener and gelling agent. - Slows glucose absorption to help manage blood sugar. - Increases satiety to aid in weight management. - Lowers cholesterol to support heart health. - Functions as a pharmaceutical binder and gel matrix former.
5	Psyllium Mucilage 	- Relieves constipation and improves bowel regularity. - Lowers cholesterol and supports heart health. - Helps manage blood sugar levels after meals. - Promotes fullness to assist with weight management. - Forms a soothing gel matrix for digestive and pharmaceutical uses.
6	Curcumin	- Reduces inflammation and relieves joint pain. - Neutralizes free radicals with

		powerful antioxidant properties. • Supports heart health and improves blood vessel function. • Eases symptoms of osteoarthritis and stiffness. • Boosts brain function and supports memory.
7	Tea Tree Oil 	• Kills acne-causing bacteria and reduces skin inflammation. • Fights fungal infections like athlete's foot and nail fungus. • Relieves scalp itching and treats dandruff. • Accelerates healing of minor cuts, scrapes, and insect bites. • Eliminates odour-causing bacteria when used in natural deodorants and cleansers.
8	Gotu Kola 	• Enhances memory, focus, and cognitive function. • Improves blood circulation and reduces leg swelling. • Accelerates wound healing and minimizes scarring. • Relieves anxiety, stress, and mental fatigue. • Boosts collagen production to firm skin and improve elasticity.
9	Calendula 	• Accelerates healing of minor cuts, scrapes, and burns. • Calms skin inflammation, eczema, and diaper rash. • Neutralizes free radicals with rich antioxidant properties. • Fights bacterial and fungal skin infections. • Hydrates and soothes dry, sensitive, or irritated skin.
10	Neem	• Kills acne-causing bacteria and calms skin inflammation. • Fights scalp infections, clears dandruff, and prevents lice. • Promotes oral health by reducing plaque and soothing gum disease. • Accelerates healing of minor wounds, eczema, and skin rashes. • Purifies the blood and supports strong immune function^[19-28]



III. METHOD OF PREPARATION:

A general herbal gel formulation comprises of a suitable herbal extract or active ingredient incorporated into a gel having a gelling agent such as Carbopol 934, Carbopol 940, HPMC, or sodium carboxymethyl cellulose. Purified water is used as the vehicle while glycerin or propylene glycol may be added as humectant to prevent the gel from drying and to enhance its spreadability. A suitable preservative is incorporated to prevent the growth of microorganisms while a pH adjusting agent such as triethanolamine may be used to obtain the desired pH value and viscosity.

The gelling agent is initially dispersed in purified water and allowed to hydrate before the addition of the herbal extract, humectant, preservative, and other required ingredients with continuous mixing until a uniform gel is obtained. The final volume is adjusted with purified water and the formulation is evaluated for appearance, homogeneity, pH, viscosity, spreadability, drug or extract content, stability, and microbial quality^[29].

IV. CONCLUSION:

Herbal gels are promising topical formulations that combine the therapeutic benefits of medicinal plants with the advantages of gel-based delivery. Plants such as Aloe vera, neem, calendula, curcumin, and gotu kola may provide useful anti-inflammatory, antimicrobial, antioxidant, and wound-healing effects. Proper formulation and evaluation are essential to ensure their safety, stability, and effectiveness. Overall, herbal gels have good potential for pharmaceutical, dermatological, and cosmetic applications.

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