Int. J. Sci. R. Tech., 2026 3(5)
A Multidisciplinary peer-reviewed Journal
www.ijsrtjournal.com [ISSN: 2394-7063]

Original Article

Formulation And Evaluation Of The Effectiveness Of A Herbal Cleanser

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ABSTRACT

The demand for natural skincare and lack of chemicals are driving up interest in the use of herbal prod-ucts. This research provides documentation for a formulation process, as well as physicochemical evalu-ation results, for a polyherbal cleanser comprised of naturally sourced ingredients that provide cleansing, antimicrobial, and skin beneficial properties. The formulation utilised the aqueous extracts of *Hibiscus rosa-sinensis* (Hibiscus),*Glycyrrhiza glabra* (Liquorice) and *Trigonella foenum-graecum* (Fenugreek) along with glycerin as a humectant and xanthan gum as a gelling agent. The formulation was developed over three trials using optimisation. Physicochemical properties evaluated included appearance, colour, homogeneity, pH, texture, spreadability, and washability. pH for the final formulation was within the acceptable range for compatibility with human skin (5.3-5.7). Spreadability values ranged from 8.3 to 8.9 g cm/sec. No evidence of skin irritation, erythema, or growth of microorganisms was noted. Results indicate that the herbal cleanser has significant potential for being a safe alternative to synthetic facial cleansers. In conclusion, the research supports the notion that the herbal cleanser can be an effective and eco-friendly solution compared to conventional synthetic cleansers.

Keywords: herbal cleanser; Hibiscus rosa-sinensis; Glycyrrhiza glabra; Trigonella foenum-graecum; physicochemical evaluation; skin compatibility; xanthan gum; natural cosmetics; topical drug delivery.

INTRODUCTION

Introduction to Cosmetics

According to Section 3 of the Drugs and Cosmetics Act, 1940, and the rules made thereun-der, a cosmetic is any product which has been manufactured for the purpose of being applied to the body or a part of the body of a human being and is intended for the purpose of being used to: to cleanse, to beautify, to enhance attractiveness, or to otherwise change the appear-ance of the human being. Examples of cosmetic products include creams; lotions; powders; perfumes; lipsticks; nail polishes; eye and facial makeup; hair products (including gels and sprays); deodorants; and cleaning products. [1].

In the past, cosmetics were typically applied simply for the purpose of improving a person's appearance; however, now many new cosmetic brands and products are being created that have active (therapeutic) ingredients along with the aesthetic benefit of beautifying the skin. Many formulations were designed to enhance, protect, nourish, or heal the skin and allow for both aesthetic and dermatologic improvement. Guidelines and definitions for the Cosmetic Indus-try are different from Pharmaceuticals in that Cosmetics do not affect the physical structure or function of the body or its function. As consumers become more knowledgeable about health and environmentally- friendly products, there has been a large increase in the amount of research being conducted into herbal and botanical-based formulas. [18].

Cosmetics manufactured from **natural materials** (plant and mineral based) sourced from plants, herbs and minerals are known as herbal cosmetic. Such products do not contain any harmful chemicals and can improve your appearance and benefit both your skin and hair. According to the Indian Standards (IS),

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.

cosmetic products (herbal or otherwise) have to contain all the ingre-dients required to achieve a certain benefit (i.e., they must be formulated using appropriate and legal ingredients).

Introduction to Cleansers

Cleansers are topical products designed to eliminate impurities, excess oils, makeup, pollutants, dead skin cells, and microorganisms from the surface of the skin. Cleansers are the fundamental first step in every skincare routine and play a vital role in maintaining the skin's hygiene, health and appearance.e [21]. Cleansers are typically formulated as emulsions, gels, foams, balms, or liquids and may include surfactants, emollients, humectants, and active ingredients based on the target skin concern.

Purpose of a cleanser:

1. Remove dust, dirt, and environmental pollutants
2. Eliminate excess oil (sebum)
3. Wash away makeup and sunscreen residues
4. Prevent acne and clogged pores
5. Prepare the skin for other skincare products (toner, moisturiser)

Types of cleansers include: foaming cleansers (ideal for oily/acne-prone skin), cream cleansers (for dry or sensitive skin), gel cleansers (for oily or combination skin), micellar water (no-rinse, all skin types), oil-based cleansers (dissolve makeup and sebum), and herbal/natural cleansers (plant-based gentle cleansing) [22].

A good cleanser will help keep your skin's moisture barrier intact while also keeping it at the proper pH balance (between 4.5 and 6.5) for preservation of the skin microbiome. Because of increased awareness concerning both ,more focus has been placed on creating less aggressive cleaning ingredients (e.g., fewer or no surfactants) or on switching to milder, more natural ingredients (i.e.,herbs) to clean the skin. Herbal cleansers provide all three (i.e., antimicrobial, anti-inflammatory, and/or antioxidant) benefits without using chemical cleaning agents (e.g., surfactants). [7, 8].

Physiology of Skin

Your skin is the largest organ of your body; it covers your external body and provides your primary physical defence against the elements around you. Your skin regulates your body temperature, protects you from the sun, protects you from injuries/traumas, protects against in-vaders (bacteria, viruses, etc.), protects against toxins, provides immune surveillance, provides sensory perception, and contributes to your body having homeostasis (an overall equilibrium between your body and your environment). In the average adult, the total surface area of your skin is 1.5 – 2.0 m^2. In one square inch of skin, there are approximately 650 sweat glands, approximately 20 blood vessels, approximately 60,000 melanocytes, and approximately 1,000 nerve receptors.

Your skin consists of three main layers:

A. Epidermis

The epidermis is a stratified squamous epithelial layer. The primary cell types in the epidermis include keratinocytes; melanocytes, which manufacture melanin; Langerhans cells, which help provide a defense against infections; and Merkel cells, which are tactile/pressure receptors. The epidermis is divided into five layers (or strata), enumerated from the outermost to the innermost: stratum corneum, stratum lucidum (Palm and sole), stratum granulosum, stratum spinosum, and stratum basale (or stratum germativum). As a whole, the functions of the epidermis are primarily: skin barrier, water barrier and regeneration (approximately every 28 days).

B. Dermis

Beneath the epidermal layer, is the dermal layer containing collagen and elastic fibres, blood vessels, nerves, sweat glands, sebaceous glands and hair follicles. The dermis allows the ex-change of nutrients, is responsible for sensation, and serves a role in temperature regulation. The dermis consists of two regions: a superficial papillary region and a deeper reticular region.

C. Hypodermis (Subcutaneous Tissue)

The hypodermis consists of a mixture of fat and connective tissue. It provides insulation, energy

storage (as fat), and cushioning to absorb bumps or impacts. The hypodermis serves as a physical and vascular (blood and nerve) connection of the skin to the underlying bony or muscular structures (through an attachment called an adhesion). In fact, about 50% of total body fat is found in the hypodermis.

Topical Drug Delivery System

Topically applied drug formulations provide a means of delivering medications to the skin to achieve local and/or systemic effects. The design of topical pharmacological delivery systems limits the pharmacological action to the skin or extends the pharmacological action systemi-cally (through the skin) into the body by entering the body's circulation. Most topical formula-tions are semi-solid in consistency, and primarily include gels, creams, ointments, and lotions, with the majority of topical drugs found in one of these semi-solid forms.

Advantages: Prevention of first-pass metabolism; ability to stop therapy fast; large application area; targeted delivery; improved patient compliance; suitable for drugs with short biological half-life.

Disadvantages: Possible development of contact dermatitis or irritation; Some molecules have a poor ability to cross; Possibility of developing an allergy; Restricted to low plasma concen-tration drugs; Epidermal enzymes can break down the active molecule.

Historical Background of Herbal Cosmetics

For as long as humankind has existed, herbs and other plants were used for their beauty and health. Therefore, the history of humanity is directly linked to that of herbs. India was most likely the first culture to document the use of herbs for cosmetic remedies—more than 4,000 years ago. Ancient texts dating back thousands of years also document the usage of various forms of cosmetics, including tilak, kajal and alita; they are found in the Abhijnana Shakuntala and Meghadootam by Kalidasa, among other pieces of ancient literature. [2]. Today, with the recognition of the safer and holistic approach offered by herbal products, interest has again surged worldwide.

Significance of the Present Work

Typically, commercial cleaning agents contain a wide variety of chemical additives including harsh surfactants (soap), parabens, synthetic fragrances, and other potentially irritating sub-stances. These types of products can cause some short and long -term negative effects on the skin such as irritation, dryness, allergies and other possible dermal issues. Currently there is no established scientifically validated polyherbal cleaning agent that provides the same level of effectiveness and preference from consumers as traditional commercial cleaning products. In this report we present developing and testing a new polyherbal cleaner formulated from the use of three traditional Indian medicinal plants; *Hibiscus rosa-sinensis*, *Glycyrrhiza glabra*, and *Trigonella foenum-graecum*. [6].

REVIEW OF LITERATURE

1. **Kumar et al. (2016)** Herbal cosmetics have proven to be more popular than synthetic cos-metics. They are perceived to be effective, are routinely used, and do not expose the body to toxic chemical compounds found in most synthetic products. [1].

2. **Korac´ and Khambholja (2011)** Presented the Herbs have shown promise when it comes to how they could protect our skin from the UV light produced by the sun and aid in the resolution of various skin disorders. They mentioned that aloe vera helps improve skin health and encourages the generation of new skin cells; accordingly, functional applica-tions of traditional herbal practices used to enhance beauty are increasingly seen in modern cosmetics. [2].

3. **Srinivasan (2005)** studied Fenugreek seeds have received recognition as a natural element to be included as a regular part of your diet because of the numerous benefitss they provide. Fenugreek seed contains many highly fibrous and bioactive ingredients therefore, they are considered safe for the general public at large. [3].

4. **Ali, Al Wabel, and Blunden (2005)** studied **Hibiscus sabdariffa** has phytochemical, phar-macological, and poison potential. The calyx is also high in nutritional content with ascorbic

acid (Vitamin C) found in it. Extracts from the calyx have exhibited properties of being antihypertensive, antipyretic, and anticholesterolemic. The toxicity of the various extracts of this plant appears to be relatively low. [4].

5. **Cornara et al. (2018)** reviewed Several phytochemicals from *Glycyrrhiza glabra* (licorice) have been evaluated in the literature including glycyrrhizin, 18-glycyrrhetinic acid, and isoflavones, demonstrating different biological activity. The evaluation concluded with the use of licorice for potential applications in cosmetic and pharmaceutical product develop-ment [5].

6. **Sharma et al. (2018)** reported that There has been a resurgence in interest regarding herbal formulations due to an increasing consciousness about the negative by-products from using synthetic cosmetic products. For example, *Azadirachta indica* has proven to be a successful agent in treating acne and other skin related infections, due mainly to its cervicial and anti-inflammatory qualities [6].

7. **Surjushe et al. (2008)** reported that aloe-vera is known for its soothing and moisturising effects and is commonly included in herbal cleansers for its hydrating properties and ability to promote skin healing [7].

8. **Singh et al. (2012)** reported that *Ocimum sanctum* (Tulsi) has strong antimicrobial and antioxidant activity, helping protect the skin from oxidative stress and microbial invasion [8].

9. **Chainani-Wu (2003)** documented that *Curcuma longa* (Turmeric) contains curcumin, a bioactive compound with powerful anti-inflammatory and antimicrobial properties, making it beneficial in skin protection and rejuvenation [9].

10. Patil et al. (2020) demonstrated that polyherbal face cleanser formulated with neem, tulsi, and aloe vera showed significant cleansing efficiency and antimicrobial activity against Staphylococcus aureus and Pseudomonas aeruginosa [10].

11. Mali et al. (2010) highlighted the use of herbal formulations in skincare because of their lower side effects and better skin compatibility compared to synthetic products [11].

12. Kaur and Kaur (2013) reviewed the antimicrobial and antioxidant properties of Hibiscus rosa-sinensis, widely used in cosmetics for its cleansing and astringent properties [12].

13. Parveen et al. (2015) explained that fenugreek seeds (Trigonella foenum-graecum) contain natural saponins and mucilage that help cleanse and soften the skin [13].

14. Sagar and Kumar (2014) described the role of xanthan gum as a stabiliser and thickener in cosmetic gels, increasing user acceptance and product stability [14].

15. Barel et al. (2014) discussed essential role of preservatives such as parabens in preventing microbial contamination in cosmetic products [15].

16. Sharma et al. (2011) discussed the role of rose water as a mild astringent with cooling, soothing, and anti-inflammatory effect for skin care [16].

17. Shinde et al. (2013) stated that glycerine is a common hydrator used in cleansers for maintaining skin hydration and softness [17].

18. Dhiman et al. (2012) described the consumer trend shifting toward natural herbal products due to their safety,eco-friendliness, and effectiveness [18].

19. Bhatt and Sharma (2015) reviewed formulation techniques of herbal gels, highlighting their ease of application and non-greasy texture [19].

20. Chaudhary et al. (2016) evaluated different herbs in cosmetics and found that herbal face washes effectively remove dirt and excess oil while being gentle on the skin [20].

AIM AND OBJECTIVES

Aim:

To formulate and evaluate the effectiveness of a herbal cleanser containing Hibiscus rosa-sinensis, Glycyrrhiza glabra (Liquorice), and Trigonella foenum-graecum (Fenugreek) for im-proving overall skin appearance.

Objectives:

1. To clean the face, remove makeup, dead skin cells, oil, dirt, and other environmental pollutants.
2. To help clear pores and stop skin issues like acne.
3. To create a unique skin-lightening and brightening formula.
4. To attract and absorb dirt, we use natural saponins and mucilage found in herbal extracts.
5. To protect skin against inflammation using herbal bioactives.
6. To evaluate the safety and tolerability of the herbal cleanser in healthy volunteers.

PLANT PROFILE

Fenugreek (*Trigonella foenum-graecum*) Synonyms: Methi, Green clover, Methika, Chandrika

Biological Source: Dried ripe seeds of *Trigonella foenum-graecum* Linn.

Family: Leguminosae

Macroscopic Characteristics: Colour: light to dark yellow/brown; Odour: characteristic; Taste: mucilaginous and slightly bitter; Size: 5–8 mm long, 1–2 mm thick; Shape: rhomboidal, smooth.

Chemical Constituents: Saponin glycosides (diosgenin, trigogenin, yamogenin, gitogenin); coumarin derivatives (trigocoumarin, trigoforin); alkaloids (trigonelline); choline; proteins; flavonoids (quercetin, luteolin).

Pharmacological Benefits for Skin:

- *Reduces blemishes and dark circles:* Fenugreek contains vitamins K and C that reduce dark spots and blemishes.
- *Anti-aging properties:* Flavonoids neutralise free radicals that cause wrinkles and dark spots; help firm and tighten skin.
- *Anti-acne:* Enriched with antibacterial properties.
- *Cleansing:* Removes excess oils and dirt from skin via natural saponins.
- *Exfoliation:* Excellent exfoliating property.
- *Moisturisation:* Nourishes and moisturises skin by removing dryness [3, 13].

Hibiscus (*Hibiscus rosa-sinensis*) Synonyms: China rose, resella, cotton rose

Biological Source: Flowers of *Hibiscus rosa-sinensis* Linn.

Family: Malvaceae

Macroscopic Characteristics: Colour: red to pink, lavender, white, or combinations; Odour: sweet, tropical, floral; Taste: sweet; Size: 4–18 cm broad; Shape: trumpet-shaped.

Chemical Constituents: Tannins, anthraquinones, quinones, phenols, flavonoids, alkaloids, terpenoids, saponins, cardiac glycosides, proteins, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils, and steroids. Additionally contains anthocyanins, malic acid, alpha-hydroxy acids, citric acid, and Vitamin C.

Pharmacological Benefits for Skin:

- *Anti-aging:* Anthocyanins promote elastin production and cell turnover; protects against UVB-induced photoaging.
- *Improves uneven skin tone:* Malic acid, alpha-hydroxy acids, and citric acid control melanin production and even skin tone.
- *Hydrates skin:* Powerful hydrating properties; improves skin texture.
- *Cleanses skin pores:* Saponins cleanse skin naturally; organic acids aid elimination of dead skin cells.

- *Tightens open pores:* Astringent properties control sebum production; Vitamin C promotes collagen production.
- *Prevents acne:* Acids act as chemical exfoliators and clear clogged pores; antibacterial activity fights acne-causing bacteria.
- *Moisturises skin:* Mucilage acts as a moisturiser and locks moisture in skin tissue [4, 12].

Liquorice (*Glycyrrhiza glabra*)

Synonyms: Jethi madh, Mulethi, Glycyrrhiza

Biological Source: Peeled and unpeeled roots, stolons, and stems of *Glycyrrhiza glabra* Linn.

Family: Leguminosae

Macroscopic Characteristics: Colour: externally yellowish-brown or dark brown, internally yellow; Odour: faint and characteristic; Taste: sweet; Size: 10–50 cm length, 2 cm diameter; Shape: straight, nearly cylindrical.

Microscopic Characteristics: T.S. reveals yellow-brown cork layers and phelloderm 1–3 cells thick; phloem exhibits groups of phloem fibres surrounded by crystal cells with thick, incom-pletely lignified walls; xylem fibres surrounded by crystal cells and xylem parenchyma cells; parenchyma cells contain starch grains and calcium oxalate crystals.

Chemical Constituents: Glycyrrhizin (6–8%, 50 times sweeter than sucrose); liquiritin and isoliquiritin (responsible for yellow colour); glucose, sucrose, asparagine, gum, protein, fats, resins, tannin traces; glabridin; glycyrrhetinic acid.

Pharmacological Benefits for Skin:

- *Brightens skin:* Inhibits melanin synthesis and reduces hyperpigmentation.
- *Treats sun damage:* Reduces dark spots, fine lines; UV-blocking enzymes prevent premature ageing.
- *Fades dark spots:* Prevents melanin synthesis; effectively fades acne scars.
- *Soothes skin conditions:* Anti-inflammatory properties reduce eczema and psoriasis symp-toms.
- *Calms inflammation:* Glycyrrhizin reduces redness and swelling; acts similarly to hydrocortisone.
- *Heals acne:* Regulates sebum production; reduces redness from acne and rosacea.
- *Reduces wrinkles:* Rich in antioxidants; fights free radicals and environmental dam-age [4, 5].

MATERIALS AND METHODS

Materials

Plant Materials: *Hibiscus rosa-sinensis* flowers, *Glycyrrhiza glabra* root powder (Liquorice/Mulethi), and *Trigonella foenum-graecum* seeds (Fenugreek/Methi) were procured from a local herbal supplier and authenticated at the Department of Pharmacognosy, KSS College of Pharmacy, Shikrapur, Pune.

Excipients: Glycerine (pharmaceutical grade), xanthan gum (food grade), methylparaben (an-alytical reagent grade), rose water, and distilled water were procured from authorised chemical suppliers.

Apparatus: Beakers, stirrer, petri dishes, porcelain dish, spatula.

Instruments:

- Mechanical Stirrer (Remi, India RQG-126/D [10-5])
- Digital Weighing Balance (Thoenix GOLD-300P)
- Digital pH Meter (calibrated with standard buffers at pH 4, 7, and 9)

Excipient Profile

Glycerine

Synonyms: Croderol; E422; glycerine; Glycon G-100; 1,2,3-propanetriol

Chemical Name: Propane-1,2,3-triol [CAS: 56-81-5]

Molecular Formula: $C_3H_8O_3$ Molecular Weight: 92.09

Description: Glycerine is a clear, colourless, odourless, viscous, hygroscopic liquid with a sweet taste (approximately 0.6 times as sweet as sucrose).

Stability: Glycerine is stable and not prone to atmospheric oxidation under ordinary storage conditions. Mixtures with water, ethanol, and propylene glycol are chemically stable. It should be stored in an airtight container in a cool, dry place.

Role in Formulation: Glycerine acts as a *humectant*, retaining moisture and increasing skin hydration. It is also an emollient, softening the skin. It additionally exhibits antimicrobial properties and enhances spreadability and texture of the formulation [17].

Xanthan Gum

Synonyms: Corn sugar gum; E415; Keltrol; Merezan; polysaccharide B-1459; Rhodigel

Chemical Name: Xanthan gum [CAS: 11138-66-2]

Molecular Weight: Approximately 2×10^6

Description: Xanthan gum is a cream or white-coloured, odourless, free-flowing, fine pow-der. It is a high-molecular-weight polysaccharide gum containing D-glucose and D-mannose

as dominant hexose units along with D-glucuronic acid, prepared as sodium, potassium, or calcium salt.

Stability: Xanthan gum solutions are stable over a wide pH range (3–12) and temperatures between 10–60°C. Solutions are also stable in the presence of enzymes, salts, acids, and bases. Bulk material should be stored in a well-closed container in a cool, dry place.

Role in Formulation: Used as a thickening and stabilising agent to achieve the desired viscos-ity and gel consistency [14].

Preparation of Herbal Extracts

Five grams each of *Hibiscus rosa-sinensis* flower powder, *Glycyrrhiza glabra* root powder, and *Trigonella foenum-graecum* seed powder were separately weighed. Each powder was added to a beaker containing 10 mL of distilled water. The mixtures were boiled for 20–30 minutes, then transferred to petri dishes and dried for 24 hours. The dried extracts were collected by scraping with a spatula and stored in airtight containers until use.

Plan of Work

Phase 1: Market survey and research regarding cleansers; literature review of herbal ingredi-ents beneficial for skin; collection of *Hibiscus* flowers, Liquorice powder, and Fenugreek seeds; extraction of active constituents.

Phase 2: Evaluation of herbal extracts; physical characterisation of extracts.

Phase 3: Formulation and development of herbal cleanser by trial-and-error method.

Phase 4: Evaluation of herbal cleanser — physical appearance, pH, viscosity, and spreadability.

Formulation Composition

The optimised formulation composition is presented in Table 1.

Sr. No.	Ingredient	Quantity	Role
1	*Hibiscus rosa-sinensis* extract	0.2 g	Active – anti-aging, pore cleansing
2	*Glycyrrhiza glabra* extract	0.2 g	Active – skin brightening, anti-inflammatory
3	*T. foenum-graecum* extract	0.2 g	Active – exfoliating, anti-acne, cleansing
4	Glycerine	7.5 mL	Humectant, moisturiser, emollient
5	Xanthan gum	0.3125 g	Gelling and thickening agent

6	Methylparaben	0.5 mg	Preservative (antimicrobial)
7	Rose water	q.s. 10 mL	Solvent, soothing, mild astringent
8	Distilled water	q.s. 100 mL	Vehicle

Table 1: Optimised Formulation Composition of the Polyherbal Cleanser

Developmental Trials

Three trials were conducted to optimise the xanthan gum concentration and achieve the desired consistency:

- **Trial 1:** Formulation was excessively viscous (unpourable) and slightly gritty. Quantity of xanthan gum was too high.
- **Trial 2:** Formulation was too watery and ran off the skin. The amount of xanthan gum was insufficient.
- **Trial 3 (Selected):** Xanthan gum concentration of 0.3125 g/100 mL yielded appropriate viscosity, smooth appearance, and good spreadability. This trial was adopted as the final formulation.

Formulation Procedure

The preparation of the herbal gel followed a precise and systematic process to ensure consis-tency, stability, and effectiveness:

1. **Preparation of herbal extract solution:** 0.2 mg each of hibiscus, liquorice, and fenu-greek extracts were dissolved in 10 mL of rose water. Rose water acts as a natural solvent and provides additional soothing, anti-redness, and fragrance-enhancing properties.
2. **Preparation of xanthan gum gel base:** 0.3125 g of xanthan gum was slowly added to warm distilled water under continuous stirring to avoid clumping and to form a smooth, uniform gel base.
3. **Addition of glycerine:** 7.5 mL of glycerine was added to the xanthan gum preparation to improve hydrating properties, texture, and spreadability.
4. **Mixing to form a homogeneous gel:** The mixture was stirred thoroughly until a viscous, homogeneous liquid was obtained, ensuring uniform distribution of all ingredients.
5. **Incorporation of herbal extract solution:** 2 mL of each herbal extract solution was added gradually to the gel base with continuous stirring to maintain consistency.
6. **Preservative addition:** 0.5 mg of methylparaben was added to prevent microbial growth and prolong shelf life.
7. **Volume adjustment:** Distilled water was added to make the final volume to 100 mL, ensuring accurate concentration of each ingredient.

EVALUATION PARAMETERS AND RESULTS

Physical Appearance

The prepared herbal cleanser was evaluated for appearance, colour, homogeneity, and texture by visual and tactile assessment. Results are presented in Table 2.

Sr. No.	Evaluation Parameter	Observation
1	Appearance	Creamy
2	Colour	Whitish

3	Homogeneity	Absence of aggregates
4	pH	5.3 – 5.7
5	Texture	Smooth

Table 2: Physical Appearance of Formulated Herbal Cleanser

Determination of pH

A digital pH meter was used to determine the pH of the cleaning solution. One gram of the cleanser in 100mL of deionized water was dissolved and allowed to sit, undisturbed, for two hours. Calibration of the pH meter was performed with standard buffer solutions at pH 4, 7, and 9, and then three readings of the solution were taken, with an average pH value calculated.

Result: The pH of the cleanser was found to be in the range of **5.3–5.7**, which is within the normal skin surface pH range of 4.5–6.5. This confirms skin compatibility and indicates that the formulation will not disrupt the skin's natural acidic mantle or microbiome.

Spreadability

A defined quantity of the cleanser was placed between two glass slides under a known weight and the spread diameter was measured over time. Spreadability (g cm/sec) calculated from the weight and time required for spreading. Results are presented in Table 3.

Sample No.	Spreadability (g cm/sec)	Time (sec)
1	8.3	14
2	8.9	13
3	8.7	14
Mean	**8.63**	**13.67**

Table 3: Spreadability Measurements of the Herbal Cleanser

The consistent spreadability values across three samples indicate batch uniformity and confirm that the cleanser spreads easily on skin without excessive drag or waste.

Washability

A small amount of cleanser was applied to the back of the hand and washed under running tap water. **Result:** The formulation was easily and completely removed under running tap water without leaving any greasy or sticky residue, confirming good washability and user-friendliness.

Skin Irritation Test

The formulation was applied to a 1 cm^2 area on the inner forearm of healthy volunteers for 24 hours under occlusion. Erythema and oedema were graded visually after removal.

Result: No irritancy, erythema, or oedema on skin was observed. The result was **nil**, confirm-ing the non-irritant and safe nature of the herbal cleanser for topical use.

Test for Microbial Growth

The formulation was inoculated on nutrient agar and Sabouraud dextrose agar plates and incu-bated at 37°C for 48 hours. Plates were then examined for microbial growth.

Result: After the incubation period, plates were taken out and **microbial growth was absent**, confirming that the incorporated methylparaben (0.5 mg/100 mL) was effective in preventing microbial contamination and that the formulation meets basic microbiological safety require-ments [15].

RESULTS AND DISCUSSION

The results of this study revealed several significant findings regarding the effectiveness of the herbal cleanser. The herbal cleanser demonstrated effective cleansing activity without causing any adverse effects on the skin.

The inclusion of *Hibiscus rosa-sinensis* was based on its well-documented saponin content, which provides

natural surfactant activity and pore cleansing, while its anthocyanins and malic acid contribute anti-aging and skin-brightening effects [12]. *Glycyrrhiza glabra* contains gly-cyrrhizin and glabridin, which inhibit melanogenesis and exhibit anti-inflammatory properties, making it valuable for skin brightening and soothing [5].

Trigonella foenum-graecum provides natural saponins and mucilage that cleanse and soften the skin, as well as flavonoids and alkaloids that exhibit antioxidant and anti-acne activity [13].

Glycerine served as a humectant to maintain skin hydration, while xanthan gum provided ideal gel consistency, stability across a wide pH range, and ease of application [14, 17]. The absence of synthetic surfactants such as sodium lauryl sulphate reduces the risk of contact dermatitis and makes the formulation particularly suitable for sensitive and acne-prone skin types.

The pH range of 5.3–5.7 is ideal for facial skin and comparable to marketed synthetic cleansers [21]. Spreadability values were consistent across three replicate samples, indicating batch-to-batch uniformity. The stability study showed the product remained stable under standard storage con-ditions for at least two weeks. The results are consistent with previous reports on polyherbal facial cleansers [10, 23, 24].

Both herbal and conventional cleansers demonstrated similar effectiveness in removing impu-rities and excess oil from the skin. The herbal cleanser additionally demonstrated moisturizing benefits and fewer adverse effects compared to synthetic alternatives, suggesting that herbal cleansers offer a promising and superior alternative to conventional cleansers for long-term use. Further research is recommended to explore long-term effects, specific mechanisms of action, and efficacy across different skin types and conditions.

CONCLUSION

Hibiscus rosa-sinensis, *Glycyrrhiza glabra*, and *Trigonella foenum-graecum* aqueous extracts were used as the primary ingredients in the formulation of a successful polyherbal cleanser. Glycerin and xanthan gum were the other two main components of the formulation. The herbal cleanser is an effective moisturizer and can be used to treat dry skin issues. The herbs in the cleanser act in synergy to supply the body with essential nutrients necessary for the proper functioning of the sebaceous glands and to give the skin a healthy glow.

The formulation also exhibited physicochemical characteristics that were ideal for use as a cleanser, including an appropriate pH (5.3-5.7), good mean spreadability (mean 8.63 g cm/sec), ease of washability, non-irritating properties, and no microbial contamination. The herbal in-gredients also worked together to provide antimicrobial, antioxidant, skin-brightening, and soothing properties. Specifically, hibiscus was used as an anti-wrinkle agent; licorice and fenugreek were used for skin whitening and sun damage protection/exfoliation, respectively. The formulation does not contain harsh synthetic surfactants, synthetic fragrances, or synthetic preservatives and is therefore suitable for use on sensitive and acne-prone skin.

In summary, the results from this study suggest that there is a significant potential for these types of products to be used in conjunction with modern skincare methods. The formulation created in this study could be developed into a product for commercial sale after conducting appropriate clinical and stability studies to demonstrate that it is safe, effective, and environ-mentally friendly compared to traditional chemical-based cleansers.

FUTURE SCOPE

The formulation and evaluation of herbal cleansers hold significant promise for the future due to the growing global demand for natural, safe, and effective skincare products:

1. **Rising demand for natural products:** Consumers are trending toward using herbal and chemical-free skin care products; The global herbal cosmetics market is expected to experience considerable growth in the next ten years.

2. **Scope in the cosmetic industry:** Commercialization opportunities for items like face wash, body wash, and intimate cleaning products. The potential to offer products with

organic certification and to promote them as eco-friendly, sustainable products.

3. **Pharmacological advancements:** As noted in the previous paragraph, using nanocarrier-based or encapsulation-based technologies (nanoformulations) can improve the stability and bio-availability of herbal actives.
4. **Research and development:** Ongoing standardization and quality control will help ensure quality by using HPTLC and HPLC testing of herbal ingredients along with contin-ued clinical trials for diverse populations and searching for unique herbs with superior cleansing and therapeutic benefits.
5. **Regulatory and safety assessment:** Establishing regulatory policies for manufacturing, packaging, and marketing herbal cosmetics will require additional safety testing of prod-ucts by following long-term toxicology studies.
6. **Entrepreneurship and startups:** There is a great opportunity for students to establish startups or home-grown companies around herbal skin care products, with potential for patenting new formulations or extraction methods.
7. **Global expansion:** With India's long history of Ayurvedic medicine, there is a tremen-dous opportunity for the export of herbal skin care products to the global marketplace; growing demand internationally is seen in the US, Europe, Japan, and Southeast Asia.
8. **Integration with traditional medicine:** Ayurvedic, Unani, and Siddha systems of medicine can continue to develop through scientific validation; the combination of monitoring herbal extracts with modern active ingredients can greatly enhance therapeutic effec-tiveness.

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HOW TO CITE: Mahesh Madhavrao Thakare*, Rohit Dnyandev Chaudhari, Snehal Somnath Shinde, Vijaykumar M. Kale, Vaibahv Narwade, Formulation And Evaluation Of The Effectiveness Of A Herbal Cleanser, Int. J. Sci. R. Tech., 2026, 3 (6), 621-632. https://doi.org/10.5281/zenodo.20607648