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Research Article

Development of a Polyherbal Soap Using Tulsi, Neem, Aloe Vera, And Turmeric: A Natural Skincare Approach

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ABSTRACT

The increasing consumer preference for natural and skin-friendly cosmetic products has led to a surge in the development of herbal-based formulations. This study focuses on the formulation and evaluation of a herbal soap using extracts from Ocimum tenuiflorum (Tulsi), Azadirachta indica (Neem), Aloe barbadensis (Aloe vera), and Curcuma longa (Turmeric), all known for their therapeutic skin benefits. The leaves and rhizomes were sourced from organic local gardens, shade-dried to preserve phytochemicals, and processed using standard extraction techniques. A glycerin soap base was used for formulation, and rose water was incorporated for its cooling effect and pleasant aroma. Three different batches were prepared with varying concentrations of the herbal ingredients to optimize the formulation. The final products were evaluated for key physicochemical and sensory parameters, including appearance, odor, pH, foam height, solubility, washability, and skin irritancy. The formulated soap showed a brownish-black appearance, smooth texture, and aromatic fragrance. The pH ranged between 8 and 9, within the acceptable range for skin use. The soap produced satisfactory foam height (150 mm), was soluble in water, and showed good washability. No skin irritation was observed during the irritancy test. The study concluded that the herbal soap is safe for topical application and effective as a natural alternative to synthetic soap products. Its formulation leverages the antimicrobial, antifungal, and skin-soothing properties of the selected herbal extracts. Further studies on antimicrobial efficacy and stability are recommended to establish long-term usability and commercial potential.

INTRODUCTION

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Skin Structure and Its Role in Health

The skin is the body's largest organ and serves as the first line of defense against environmental aggressors, including microorganisms, ultraviolet radiation, chemicals, and physical injury. It plays crucial roles in thermoregulation, immune surveillance, hydration control, and sensory perception [1]. Composed of three main layers—epidermis, dermis, and hypodermis—the skin provides structural support and maintains internal homeostasis [2]. Among these, the epidermis acts as the primary barrier, particularly due to the stratum corneum, which controls trans-epidermal water loss and prevents entry of pathogens [3]. Maintaining the health of the skin is not only essential for physical protection but also for mental and social well-being. Skin conditions such as dryness, acne, or infections significantly affect an individual's quality of life and often require targeted interventions [4]. Hence, understanding the nature of skin and adopting appropriate skincare practices are vital.

Types of Skin and Basic Skincare Needs

Skin type is determined by genetic, environmental, and hormonal factors. It is generally classified into five types: normal, oily, dry, combination, and sensitive [5].

- Normal skin displays a balanced hydration level, fine pores, and minimal imperfections.
- Dry skin is deficient in natural moisturizing factors and may become flaky, rough, or irritated.
- Oily skin tends to produce excess sebum, resulting in shiny appearance, enlarged pores, and acne susceptibility.
- Combination skin exhibits oily characteristics in the T-zone (forehead, nose, chin) and dryness on the cheeks.
- Sensitive skin is easily irritated by external stimuli, showing signs like redness, burning, or itching even with mild products [6]. A suitable skincare routine must cater to these individual differences and maintain the integrity of the skin barrier. Cleansing is a fundamental step in all skincare routines. However, excessive or inappropriate use of harsh soaps may strip the skin of its natural oils, leading to irritation or inflammation [7].

The Role of Soap in Skincare

Soap is a widely used personal hygiene product formulated by the saponification reaction, where triglycerides (fats/oils) react with an alkali to produce glycerol and soap salts. Soaps function as surfactants—lowering surface tension and emulsifying oils and dirt—thus enabling their removal from the skin [8]. Despite their cleansing properties, many commercial soaps contain artificial fragrances, petrochemicals, preservatives, and synthetic surfactants like sodium lauryl sulfate, which may disrupt the skin microbiota and provoke allergic or irritant contact dermatitis [9]. As consumers become increasingly conscious of these drawbacks, there has been a strong shift towards natural and herbal-based soaps that offer mild yet effective cleansing without compromising skin health [10].

Herbal Soaps: A Safer, Biocompatible Alternative

Herbal soaps are prepared using plant-based extracts, essential oils, and natural colorants. Unlike synthetic products, they are free from harmful chemicals, making them suitable for all skin types, particularly for individuals with

sensitive or allergy-prone skin [11]. The therapeutic value of herbal ingredients lies in their phytoconstituents such as flavonoids, saponins, alkaloids, glycosides, and essential oils, which exhibit antimicrobial, antioxidant, anti-inflammatory, and wound-healing properties [12]. Thus, herbal soaps not only cleanse the skin but also enhance its physiological resilience and texture.

Common Skin Disorders and Herbal Management

Skin disorders like acne vulgaris, bacterial and fungal infections, eczema, and dermatitis are widespread, affecting both urban and rural populations globally. Factors contributing to these issues include excessive pollution, microbial exposure, poor hygiene, hormonal imbalances, and the use of unsuitable skincare products [13]. Chemical-based treatments, though effective, often have limitations including resistance development (in the case of antimicrobials), allergic reactions, and long-term toxicity [14]. Consequently, there is growing demand for herbal interventions that are safer and more sustainable. Herbs such as Tulsi, Neem, and Aloe vera are among the most studied natural remedies for dermatological conditions.

Therapeutic Significance of Tulsi (Ocimum sanctum)

Tulsi, also known as Holy Basil, has been revered in Ayurveda for its antimicrobial, antioxidant, and anti-inflammatory properties. It contains active constituents such as eugenol, ursolic acid, and carvacrol that combat bacterial and fungal infections [15]. Tulsi extract is known to promote wound healing, prevent acne formation, and improve skin elasticity, making it an ideal component in herbal cosmetic formulations [16]. Its adaptogenic and detoxifying effects help in maintaining skin balance and reducing oxidative damage induced by environmental stressors [17].

Antimicrobial Potential of Neem (Azadirachta indica)

Neem is widely recognized for its medicinal efficacy, especially in treating skin ailments. Its leaves and oil contain compounds like azadirachtin, nimbidin, and nimbolide that exhibit strong antibacterial, antifungal, and anti-inflammatory actions [18]. Neem-based preparations are effective against Propionibacterium acnes, Staphylococcus aureus, and Candida albicans, pathogens commonly involved in acne and skin infections [19]. Neem also enhances skin immunity and reduces inflammation, making it a preferred choice for formulating dermatological products [20].

Moisturizing and Healing Properties of Aloe Vera (Aloe barbadensis miller)

Aloe vera gel is a rich source of polysaccharides, enzymes, vitamins (A, C, E, B12), and amino acids, contributing to its skin-soothing and moisturizing properties. It is especially effective in treating dry, irritated, or sunburned skin [21]. The mucopolysaccharides in Aloe help retain skin moisture, while its gibberellins and auxins promote collagen synthesis and wound healing. Moreover, Aloe exhibits mild antimicrobial properties and is commonly used to manage minor cuts, eczema, and burns [22].

Need for the Work

The increasing awareness of the adverse effects associated with synthetic skincare products has led to a global interest in herbal and natural alternatives. Many commercial soaps contain chemical agents such as artificial fragrances, surfactants, and preservatives, which can disrupt

the skin's natural barrier, cause dryness, irritation, or even long-term skin damage. This has prompted both consumers and researchers to explore safer and more skin-friendly options for daily cleansing and skincare routines. Natural herbs, especially those used traditionally in Indian medicine, offer a wide range of skin benefits due to their antibacterial, antifungal, anti-inflammatory, and antioxidant properties. Plants like *Ocimum sanctum* (Tulsi), *Azadirachta indica* (Neem), and *Aloe barbadensis* (Aloe vera) are recognized for their therapeutic activities and skin compatibility. These herbs have been used for centuries to treat skin ailments such as acne, eczema, wounds, and infections, yet their incorporation into modern personal care formulations is still limited. Combining them in a single soap formulation can help bridge the gap between traditional herbal knowledge and modern skincare demands. Tulsi is known for its strong antimicrobial and anti-inflammatory activity, which helps protect the skin from microbial infections and reduces acne-related inflammation. Neem contains bioactive compounds like nimbidin and azadirachtin that exhibit antibacterial, antifungal, and antiparasitic properties, making it effective for managing skin infections and promoting overall skin health. Aloe vera is widely used for its moisturizing, soothing, and skin-repairing effects, making it suitable for dry, sensitive, and irritated skin. A soap formulated with these three components could potentially offer holistic benefits such as cleansing, moisturizing, and healing, all in one product. There is also a rising demand for eco-friendly and biodegradable skincare formulations that are free from animal testing and harmful residues. Soaps made from plant-based materials are typically biodegradable and non-toxic to aquatic life, making them a more sustainable choice than synthetic soaps. Incorporating herbal ingredients not only enhances product safety but also aligns with the global movement toward green chemistry and sustainable product development. Furthermore, the formulation and evaluation of herbal soaps using standardized methods are still under-explored in scientific literature. There is a clear need to develop and assess herbal soap formulations using measurable parameters such as physical characteristics, pH, cleansing ability, foaming index, and antimicrobial activity. Such studies can validate the efficacy and stability of herbal formulations, contributing to their commercial acceptability and consumer trust.

MATERIAL AND METHOD

Ingredients for Herbal Soap Formulation

The herbal ingredients selected in this formulation offer synergistic skin benefits, contributing to cleansing, hydration, and skin health. The table below presents a detailed account of each ingredient's pharmacognostic features, their cosmetic importance, and phytochemical profiles.

1. Tulsi (*Ocimum tenuiflorum*)

- Common Name: Holy Basil
- Family: Lamiaceae
- Biological Source: Leaves of *Ocimum tenuiflorum* Linn.
- Part Used: Leaves
- Chemical Constituents: Eugenol, ursolic acid, oleanolic acid, rosmarinic acid
- Properties: Antibacterial, antifungal, antioxidant, adaptogenic
- Importance: Tulsi is revered in traditional medicine for its broad antimicrobial spectrum. Eugenol, the primary active compound, exhibits antiseptic and anti-inflammatory actions. Tulsi supports skin detoxification,

helps manage acne, and brightens the skin by reducing oxidative stress [23].

2. Turmeric (*Curcuma longa*)

- Common Name: Haldi
- Family: Zingiberaceae
- Biological Source: Rhizomes of *Curcuma longa* Linn.
- Part Used: Root
- Chemical Constituents: Curcumin, demethoxycurcumin, bisdemethoxycurcumin, turmerone
- Properties: Antioxidant, antimicrobial, wound healing, anti-inflammatory
- Importance: Turmeric has a strong reputation for treating skin conditions like psoriasis and eczema. Curcumin, a potent polyphenol, reduces redness, calms inflammation, and promotes skin radiance. It accelerates healing of minor abrasions and prevents microbial infection [24].

3. Neem (*Azadirachta indica*)

- Common Name: Neem
- Family: Meliaceae
- Biological Source: Leaves, seeds, and bark of *Azadirachta indica* A. Juss
- Part Used: Leaves
- Chemical Constituents: Nimbin, azadirachtin, nimbolide, flavonoids, quercetin
- Properties: Antiseptic, antifungal, antibacterial, insect repellent
- Importance: Neem is widely recognized for its purifying and anti-acne properties. It removes excess oil, clears clogged pores, and heals scars. Azadirachtin exhibits potent antimicrobial activity, making neem ideal for controlling bacterial and fungal skin infections [25].

4. Aloe Vera (*Aloe barbadensis*)

- Common Name: Aloe
- Family: Liliaceae
- Biological Source: Gel extracted from leaves of *Aloe barbadensis*
- Part Used: Leaf pulp (gel)
- Chemical Constituents: Polysaccharides (acemannan), glycoproteins, anthraquinones (aloin), enzymes (amylase), vitamins
- Properties: Cooling, anti-inflammatory, moisturizing, soothing
- Importance: Aloe vera is known for its hydrating and skin-repairing ability. The mucilaginous gel deeply nourishes the skin, alleviates sunburn, and reduces irritation. Its enzymatic antioxidants promote skin regeneration and hydration, ideal for sensitive or sun-damaged skin [22].

5. Rose Water (*Rosa damascena*)

- Common Name: Rose
- Family: Rosaceae
- Biological Source: Petals of *Rosa damascena*
- Part Used: Flower petals

- Chemical Constituents: Phenylethyl alcohol, geraniol, citronellol, nerol
- Properties: Astringent, anti-inflammatory, soothing
- Importance: Rose water is valued for its mild astringency and natural fragrance. It tones and refreshes the skin, reduces puffiness and redness, and provides a cooling effect. Its phenolic content also exerts antibacterial effects, preserving skin integrity [26].

6. Coconut Oil (*Cocos nucifera*)

- Common Name: Coconut oil
- Family: Arecaceae
- Biological Source: Endosperm of dried coconut (copra)
- Part Used: Kernel
- Chemical Constituents: Lauric acid, caprylic acid, capric acid, myristic acid
- Properties: Emollient, antimicrobial, moisturizing
- Importance: Coconut oil contributes to a rich and creamy lather in soap. Its lauric acid content aids in skin barrier repair and hydration. It penetrates the skin, keeping it supple, smooth, and free of microbial colonization [27].

7. Glycerin Soap Base

- Type: Transparent, vegetable-based
- Part Used: Whole soap base
- Properties: Moisturizing, gentle cleanser, humectant
- Importance: Glycerin acts as a humectant, drawing moisture from the environment into the skin. It forms a protective layer, preventing dryness and irritation. It is ideal for users with sensitive or dry skin conditions and enhances transparency of soap [28].

8. Distilled Water & Ethanol (70%)

- Purpose: Extraction and formulation medium
- Importance: Distilled water ensures formulation purity, while 70% ethanol helps in solubilizing plant-based bioactives and acts as a mild antiseptic during processing [29].

Collection and Extraction of Herbal Ingredients

To ensure the efficacy of the herbal soap formulation, fresh plant materials were collected and processed using simple yet effective extraction techniques. Each plant component was carefully handled to preserve its bioactive constituents.

1. Collection of Herbal Materials

- Fresh Tulsi (Ocimum tenuiflorum) leaves, Neem (Azadirachta indica) leaves, Aloe vera (Aloe barbadensis) leaves, and Turmeric (Curcuma longa) rhizomes were procured from organically grown local gardens and identified by a certified botanist.
- All raw materials were washed thoroughly under running water to remove dirt and microbial contaminants, then shade-dried at room temperature to retain phytoconstituents and avoid photodegradation [30].

2. Extraction of Tulsi Leaves

- The dried Tulsi leaves were coarsely crushed using a sterile mortar and pestle (Kharal).

- The crushed mass was macerated, then squeezed through clean muslin cloth to separate the liquid.
- The filtrate was further passed through Whatman filter paper no.1 to remove particulate matter and obtain a clear Tulsi extract.
- This aqueous extract was stored in a clean amber-colored container under refrigeration to prevent degradation [31].



Figure 1: Crushing of Tulsi Leaves with Mortar and Pestle



Figure 2: Maceration and Filtration of Crushed Tulsi Mass

3. Extraction of Neem Leaves

- Fresh Neem leaves were subjected to the same method as Tulsi extraction.
- The leaves were washed, shade-dried, crushed in a mortar and pestle, and then filtered using a muslin cloth followed by Whatman filter paper.
- The aqueous neem extract was collected and stored in airtight containers [18].



Figure 3: Washing, Drying, and Crushing of Neem Leaves



Figure 4: Filtration Using Muslin Cloth and Whatman Filter Paper

4. Extraction of Aloe Vera Gel

- Fresh, thick aloe vera leaves were washed and cut longitudinally to separate the mucilaginous gel.
- The gel was carefully scooped using a sterile spoon and homogenized manually.
- It was then filtered through a clean muslin cloth to remove fibers and impurities, ensuring a smooth gel-like extract.
- The fresh extract was immediately refrigerated to prevent oxidation and microbial spoilage [32].

5. Preparation of Turmeric Powder

- Fresh turmeric rhizomes were cleaned and shade-dried for several days.
- The dried rhizomes were crushed using a mortar and pestle to obtain a coarse powder.
- The powder was passed through mesh sieves (sieve no. 60) to obtain a fine, uniform turmeric powder suitable for soap formulation [33].



6. Crude Extract Preparation and Usage

- All collected extracts (Tulsi, Neem, Aloe Vera, and Turmeric powder) were stored in sterile, labeled containers.
- These crude extracts were directly incorporated into the soap base without any further solvent extraction or distillation.
- This simple aqueous and mechanical extraction process is ideal for herbal cosmetic formulations as it retains maximum natural potency and safety for skin application [34].

Formulation of Herbal Soap

- **Source of Ingredients**

Table 1: Source of Ingredients [35-37]

Ingredients	Source (Plant Part or Type)
Tulsi	Leaves of *Ocimum tenuiflorum*
Neem	Leaves of *Azadirachta indica*
Aloe Vera	Leaf pulp of *Aloe barbadensis*
Turmeric	Rhizome of *Curcuma longa*
Rose Water	Laboratory-prepared solution (*Rosa damascena*)
Glycerine Soap Base	Laboratory grade

- **Role of Ingredients**

Table 2: Role of Ingredients in Soap [18, 31, 34, 38]

Ingredients	Therapeutic Role in Soap
Tulsi Extract	Antibacterial, Antimicrobial
Neem Extract	Antibacterial, Anti-acne
Aloe Vera Extract	Anti-aging, Moisturizing
Turmeric Powder	Antifungal, Wound Healing
Glycerine Soap Base	Soap base, Hydrating agent
Rose Water	Cooling, Skin Soothing

- **Formulation Profile**

Table 3. Formulation Profile

Ingredients	Quantity
Tulsi	5.5 g
Neem	5.5 g
Aloe Vera	5 g
Turmeric	2 g
Soap base	50 g
Rose water	4 ml
Coconut oil	5 ml

The formulation method involved drying and crushing the herbal leaves (Tulsi and Neem),

extracting the gel from Aloe vera, and grinding the turmeric root to a fine powder. All extracts were filtered using clean muslin cloth and Whatman No.1 filter paper to remove particulate matter, and were then incorporated into the melted glycerine soap base at controlled temperatures. Coconut oil was added to enhance moisturization and improve lathering properties [39,68].

Procedure for Herbal Soap Preparation

The herbal soap was formulated by using plant-based ingredients including *Ocimum sanctum* (Tulsi), *Azadirachta indica* (Neem), *Aloe barbadensis* (Aloe vera), and *Curcuma longa* (Turmeric) along with a glycerin base and rose water through the melt and pour method, widely accepted in herbal soap formulation [34].

Procedure:

1. 5.5 g of Neem powder and 5.5 g of Tulsi powder were measured and taken into a beaker, along with 5 g of Aloe vera gel; the contents were mixed to a uniform blend [40,41].
2. Rose water (4 ml) and turmeric powder (2 g) were added to the mixture and stirred continuously for 2–3 minutes [42].
3. 50 g of glycerin soap base was heated and melted in a controlled water bath, and 5 ml of coconut oil was added for moisturizing effect [43,47].
4. The blended herbal mixture was introduced into the melted soap base and mixed properly [44].
5. The heating process was terminated and the mixture was poured into molds and allowed to cool at ambient temperature [45].
6. After complete solidification, the soaps were demolded and packed in sterile wrapping to maintain quality and hygiene [46].

Evaluation of Herbal Soap Formulation

Herbal soap was evaluated for various physicochemical and organoleptic parameters to assess its safety, efficacy, and quality. These parameters are essential to confirm consumer acceptability and regulatory compliance in herbal cosmetic formulations [34].

1 Organoleptic Evaluation

Organoleptic characteristics such as colour, Odor, and texture were visually and physically assessed:

- **Colour:** Brown, due to the presence of turmeric, neem, and tulsi extracts.
- **Odour:** Aromatic, indicating the presence of natural essential oils and rose water.
- **Appearance:** Smooth texture, demonstrating proper homogenization and blending of the soap base with herbal additives [44].

Organoleptic evaluation is a primary step in the preliminary assessment of cosmetic formulations and influences consumer preference [45].

2 pH Determination

To determine the pH, approximately 5–6 g of the formulated soap was weighed and transferred into a 100 mL beaker. About 40 mL of distilled water was added, and the soap was allowed to disperse uniformly. The pH of the resulting solution was measured using a calibrated digital pH meter [40]. The pH of the herbal soap was found to be in the range of 6.0 to 6.5, which is suitable for maintaining the skin's natural pH and does not cause irritation [48].

3 Foam Height Test

To evaluate the foaming ability of the soap, 0.5 g of the sample was dissolved in 25 mL of distilled water. The solution was then transferred to a 100 mL measuring cylinder and made up to 50 mL with additional distilled water. The cylinder was shaken vigorously for 25 strokes, and the foam height above the aqueous solution was measured [46].

A stable foam of considerable height was observed, indicating good surfactant and cleansing properties in the herbal soap [49].

4 Solubility Test

For the solubility evaluation, 1.5 g of the soap was added into 10 mL of different solvents such as water, ethanol, and chloroform. The mixture was shaken for 3 minutes, and the solubility behavior was observed visually [44]. The soap showed good solubility in water and partial solubility in ethanol, but it was insoluble in non-polar solvents like chloroform, indicating the presence of hydrophilic constituents [50].

5 Skin Irritancy Test

The skin irritancy test was performed by applying a small quantity of the soap on a cleaned area of human skin (forearm) and observing the area for 24 hours. Parameters like redness, itching, or burning sensation were noted [51]. No signs of irritation were observed, suggesting that the herbal soap formulation is safe for external use and does not harm normal skin physiology [52].

6 Washability Test

To assess washability, the formulated soap was applied to the skin and then rinsed with water. The ease of removal and any residue were recorded manually [53]. The soap was found to be easily washable, leaving no oily or greasy residue on the skin, which further confirms the effective formulation of the soap [54].

RESULT

The formulated herbal soap was evaluated based on various physicochemical and organoleptic parameters. The results are presented below:

Table 4: Evaluation Parameters and Observations

Parameter	Observation
Appearance	Brownish black
Odor	Pleasant herbal fragrance
pH	8–9 (within acceptable range for topical applications)
Foam Height	150 mm (indicating good foaming ability)
Solubility	Soluble in water
Washability	Good
Skin Irritability	No irritation observed

These results indicate that the herbal soap formulation possesses acceptable aesthetic appeal, cleansing efficacy, foamability, and skin compatibility, making it suitable for cosmetic use. The pH value lies within the dermatologically safe range, and no adverse skin reactions were noted during irritancy testing [40,53].

DISCUSSION

The formulated herbal soap demonstrated promising characteristics in terms of physical, chemical, and dermatological evaluation. The pH of the final formulation was found to be in the range of 8 to 9, which is within the permissible limits for topical cosmetic formulations. Maintaining a slightly alkaline pH is essential in cleansing products as it enhances the soap's ability to remove oils and dirt from the skin, while still being gentle enough to avoid irritation or disruption of the skin's natural barrier function [55]. Excessively acidic or alkaline products can lead to conditions like xerosis or contact

dermatitis, and hence, a balanced pH is critical for consumer safety and comfort [56]. The appearance of the soap was reported to be brownish-black, which can be primarily attributed to the phytochemicals and natural pigments derived from Tulsi, Neem, Aloe vera, and turmeric. These herbal ingredients contain a variety of phenolic compounds, flavonoids, and essential oils, which not only contribute to therapeutic value but also give the formulation a characteristic color and aroma [57,58]. The pleasant herbal fragrance of the soap also supports the presence of volatile aromatic compounds from the plant extracts, particularly from Tulsi and Neem, which are known to contain eugenol, terpenoids, and other essential oils that contribute to both antimicrobial activity and a pleasing scent [59]. The soap showed excellent washability and complete solubility in water, which are critical parameters for consumer convenience and product efficacy. A formulation that disperses easily in water ensures better application, rinsing, and hygiene, without leaving behind any sticky residue [60]. Moreover, a foam height of 150 mm was observed, indicating substantial foaming ability, which plays a key role in the sensory appeal of soaps and their perception of cleansing efficiency by consumers [61]. Although foam does not directly correlate with cleaning power, it significantly influences user satisfaction. Most importantly, the skin irritancy test revealed no signs of irritation, redness, or allergic response after 24 hours of application, suggesting excellent dermatological compatibility. This result confirms the suitability of using plant-based ingredients such as Aloe vera, which is known for its soothing, anti-inflammatory, and moisturizing effects, along with Neem and Tulsi, which offer antibacterial and antifungal benefits without compromising skin health [62,63]. Synthetic soaps, on the other hand, often contain harsh surfactants such as sodium lauryl sulfate, artificial colors, and preservatives that can provoke adverse skin reactions, especially in individuals with sensitive skin or allergic tendencies [64]. The combined therapeutic effects of the herbal ingredients used in the formulation significantly enhance its overall performance. Tulsi (Ocimum sanctum) contains active constituents like ursolic acid and eugenol, which have shown broad-spectrum antimicrobial activity and antioxidant potential [65]. Neem (Azadirachta indica) has been extensively used in Ayurvedic medicine for its ability to combat bacterial and fungal infections, while also providing anti-inflammatory properties [22]. Aloe vera, rich in polysaccharides and vitamins, contributes to skin hydration, repair, and rejuvenation [66]. These three components work synergistically to create a formulation that is not only effective in cleansing but also promotes healthy, nourished skin. The brownish-black appearance, good foam formation, ease of washing, and absence of irritancy collectively point to a well-balanced formulation. This herbal soap can be positioned as a natural and eco-friendly alternative to commercially available synthetic soaps, catering to growing consumer preferences for green and sustainable personal care products [67]. Furthermore, the incorporation of glycerine as the soap base enhances moisturization, making the product suitable for daily use even in individuals with dry or sensitive skin.

CONCLUSION

The present study aimed to formulate and evaluate a herbal soap utilizing Tulsi, Neem, Aloe vera, and turmeric, along with a glycerine base and rose water to enhance sensory and functional properties. The formulated soap demonstrated a pH of 8–9, pleasant herbal fragrance, brownish-black coloration, and good foaming and solubility, all of which are considered essential qualities in a consumer-friendly herbal cleansing product. No

signs of skin irritation were noted during dermatological testing, affirming its safety and suitability for regular topical use. These results indicate that herbal ingredients can be successfully integrated into a natural soap formulation without compromising product stability or safety. The synergistic actions of Tulsi, Neem, and Aloe vera provided antimicrobial, antifungal, antioxidant, and skin-soothing benefits, confirming the efficacy and therapeutic potential of the final product. The inclusion of rose water further enhanced the fragrance and cooling effect, while glycerine supported hydration and smoothness on application. The study thus concludes that the formulated herbal soap is alternative to synthetic commercial soaps, with benefits such as skin compatibility, environmental friendliness, and natural antimicrobial protection. However, to fully realize its market potential, further studies are recommended. These may include microbial efficacy tests, long-term stability analysis, accelerated shelf-life testing, and comparative studies against branded soaps to substantiate and optimize its functional profile.

REFERENCES

1. Proksch E, Brandner JM, Jensen JM. The skin: an indispensable barrier. Exp Dermatol. 2008;17(12):1063–72.
2. Elias PM. Skin barrier function. Curr Allergy Asthma Rep. 2008;8(4):299–305.
3. Madison KC. Barrier function of the skin: "la raison d'être" of the epidermis. J Invest Dermatol. 2003;121(2):231–41.
4. Darlenski R, Kazandjieva J, Tsankov N, Fluhr JW. Skin barrier function: current perspectives. Clin Dermatol. 2014;32(3):297–306.
5. Zouboulis CC. Acne and sebaceous gland function. Clin Dermatol. 2004;22(5):360–6.
6. Draelos ZD. Sensitive skin: perceptions, evaluation, and treatment. Am J Clin Dermatol. 2013;14(4):277–83.
7. Mukherjee PK, Maity N, Nema NK, Sarkar BK. Bioactive compounds from natural resources against skin aging. Phytomedicine. 2011;19(1):64–73.
8. Goddard ED, Gruber JV. Principles of Polymer Science and Technology in Cosmetics and Personal Care. CRC Press; 1999.
9. Uchegbu IF, Ajayi GO. Health hazards of some chemical ingredients used in cosmetics. Niger J Pharm Res. 2011;9(2):83–88.
10. Sharma R, Verma PK, Gupta RK. Herbal soaps: A review. Int J Pharm Sci Res. 2017;8(7):2730–36.
11. Rathi A, Pandey A. Herbal cosmetics: trends and market analysis. World J Pharm Res. 2014;3(6):322–38.
12. Saxena M, Saxena J, Nema R, Singh D, Gupta A. Phytochemistry of medicinal plants. J Pharmacogn Phytochem. 2013;1(6):168–82.
13. Dahiya P, Purkayastha S. Phytochemical screening and antimicrobial activity of some medicinal plants against multidrug-resistant bacteria from clinical isolates. Indian J Pharm Sci. 2012;74(5):443–50.
14. Williams HC. Established and new treatments for atopic dermatitis. BMJ. 2000;320(7245):153–56.
15. Mondal S, Mirdha BR, Mahapatra SC. The science behind sacredness of Tulsi (Ocimum sanctum Linn.). Indian J Physiol Pharmacol. 2009;53(4):291–306.
16. Cohen MM. Tulsi - Ocimum sanctum: A herb for all reasons. J Ayurveda Integr Med. 2014;5(4):251–59.
17. Pattanayak P, Behera P, Das D, Panda SK. Ocimum sanctum Linn. A reservoir plant for therapeutic applications: An overview. Pharmacogn Rev. 2010;4(7):95–105.

18. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological activities and medicinal properties of Neem (Azadirachta indica). Curr Sci. 2002;82(11):1336–45.
19. Pandey G, Madhuri S. Pharmacological activities of Azadirachta indica: A review. Int J Green Pharm. 2010;4(2):93–99.
20. Alzohairy MA. Therapeutics role of Azadirachta indica (neem) and their active constituents in diseases prevention and treatment. Evid Based Complement Alternat Med. 2016;2016:7382506.
21. Hamman JH. Composition and applications of Aloe vera leaf gel. Molecules. 2008;13(8):1599–1616.
22. Surjushe A, Vasani R, Saple DG. Aloe vera: a short review. Indian J Dermatol. 2008;53(4):163–66.
23. Prakash P, Gupta N. Therapeutic uses of Ocimum sanctum Linn (Tulsi) with a note on eugenol and its pharmacological actions: A short review. Indian J Physiol Pharmacol. 2005;49(2):125–131.
24. Hewlings SJ, Kalman DS. Curcumin: A review of its effects on human health. Foods. 2017;6(10):92. https://doi.org/10.3390/foods6100092
25. Subapriya R, Nagini S. Medicinal properties of neem leaves: A review. Curr Med Chem Anticancer Agents. 2005;5(2):149–156.
26. Boskabady MH, Shafei MN, Saberi Z, Amini S. Pharmacological effects of Rosa damascena. Iran J Basic Med Sci. 2011;14(4):295–307.
27. Verallo-Rowell VM, Dillague KM, Syah-Tjundawan BS. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. Dermatitis. 2008;19(6):308–315.
28. Dweck AC. Natural ingredients for coloring and styling. Int J Cosmet Sci. 2002;24(5):287–302.
29. Cowan MM. Plant products as antimicrobial agents. Clin Microbiol Rev. 1999;12(4):564–582.
30. Naim R, Basu S, Saha R, Mondal TK. A comparative evaluation of phytochemicals and antioxidant capacity in shade-dried and oven-dried leaves of medicinal plants. BMC Plant Biol. 2024;24(1):152.
31. Singh S, Malhotra M, Majumdar DK. Antibacterial activity of Ocimum sanctum L. fixed oil. Indian J Exp Biol. 2005;43(9):835–837.
32. Bunyapraphatsara N, Yongchaiyudha S, Rungpitarangsi V, Chokechaijaroenporn O. Antidiabetic activity of Aloe vera L. juice. I. Clinical trial in new cases of diabetes mellitus. Phytomedicine. 1996;3(3):241–243.
33. Ammon HP, Wahl MA. Pharmacology of Curcuma longa. Planta Med. 1991;57(01):1–7.
34. Dureja H, Kaushik D, Gupta M. Cosmeceuticals: An emerging concept. Indian J Pharmacol. 2005;37(3):155–159.
35. Joshi A, Sukhwal P. Herbal soaps: An overview. World J Pharm Res. 2018;7(9):586–602.
36. Kaur R, Arora S. Herbal cosmetics: a safe way for skin. Int J Pharm Sci Rev Res. 2010;3(1):83–89.
37. Bunyapraphatsara N et al. Aloe vera: pharmacology and toxicology. Phytomedicine. 1996;3(3):241–243.
38. Ammon HP. Pharmacology of turmeric. Planta Med. 1991;57(01):1–7.
39. Ahmad I, Aqil F. In vitro efficacy of bioactive extracts of 15 medicinal plants against ESBL-producing multidrug-resistant enteric bacteria. Microbiol Res. 2007;162(3):264–275.
40. Sahu PK, Sahu RK, Roy A, Dewangan D. Preparation and evaluation of herbal soap using Aloe vera, Neem and Tulsi. Int J Pharm Pharm Sci. 2014;6(4):556–558.

41. Miraj S, Kiani S. A review of medicinal uses and pharmacological effects of Aloe vera. J Evid Based Complementary Altern Med. 2016;21(3):E76–E80.
42. Rathore M, Rathore D, Sahu M. Medicinal uses and applications of turmeric: a brief overview. J Pharm Sci Innov. 2012;1(4):24–27.
43. Ravi Kumar MN, Philip B. Melt and pour technique for preparation of herbal soaps: recent updates. Asian J Pharm Clin Res. 2017;10(2):1–4.
44. Ashawat MS, Saraf S, Saraf S. Preparation and characterization of herbal creams for improvement of skin viscoelastic properties. Int J Cosmet Sci. 2008;30(3):183–193.
45. Kamboj A, Saluja AK. Herbal cosmetics: Trends in skin care formulation. Pharmacogn Rev. 2008;2(4):230–237.
46. Kumari R, Kotecha M. Formulation and evaluation of herbal antiseptic soap using aqueous extract of Azadirachta indica. World J Pharm Res. 2014;3(9):808–817.
47. Pandey S, Meshya N, Viral D. Herbs play an important role in the field of cosmetics. Int J PharmTech Res. 2010;2(1):632–639.
48. Rele AS, Mohile RB. Effect of topical application of Aloe vera gel on UV-induced photodamage and skin pH. Indian J Dermatol. 2003;48(2):87–90.
49. Agarwal S, Choudhary P, Mishra A. Formulation and evaluation of polyherbal soap. J Pharmacogn Phytochem. 2020;9(3):1230–1234.
50. Arora R, Garg S. Solubility of medicinal plants in different solvents and its effect on formulation. Asian J Res Chem. 2014;7(2):187–190.
51. Jani GK, Shah DP, Prajapati VD, Jain VC. Gums and mucilages: versatile excipients for pharmaceutical formulations. Asian J Pharm Sci. 2009;4(5):308–322.
52. Patel RP, Patel MP, Suthar AM. Evaluation of herbal cosmetic formulations and their antimicrobial activity. Int J Drug Dev Res. 2010;2(3):887–891.
53. Sharma R, Mehta R, Dhanawat M. Evaluation of cleansing ability and skin compatibility of herbal soaps. Int J Pharm Sci Rev Res. 2012;12(2):109–112.
54. Pise A, Yadav A. Herbal soap formulation and evaluation. Int J Innov Pharm Sci Res. 2016;4(11):1531–1535.
55. Draelos ZD. Essentials of Dermatology for the Primary Care Provider. Springer; 2013.
56. Lambers H, Piessens S, Bloem A, Pronk H, Finkel P. Natural skin surface pH is on average below 5, which is beneficial for its resident flora. Int J Cosmet Sci. 2006;28(5):359–70.
57. Kumar RS, Sivakumar T. Formulation and evaluation of polyherbal soap and its antimicrobial activity. Int J Pharm Pharm Sci. 2017;9(3):92–5.
58. Singh R, Sharma P. Medicinal plants and their active constituents for dermatological disorders. Asian J Pharm Clin Res. 2015;8(1):15–20.
59. Patel J, Patel M, Vora N, Modi K. Formulation and evaluation of herbal antiseptic soap using methanolic extracts of some medicinal plants. Int J Pharm Sci Rev Res. 2010;3(1):127–31.
60. Ganesan M, Soundararajan N. Herbal cosmetics: trends and market perspectives. J Cosmet Dermatol. 2020;19(10):2412–7.
61. Kottai Muthu A, Sukumaran N. Formulation and evaluation of herbal soaps using Aloe vera and neem extract. Asian J Pharm Clin Res. 2014;7(5):66–70.
62. Basma AA, Zakaria ZA, Latha LY, Sasidharan S. Antioxidant activity and phytochemical screening of the methanol extracts of Euphorbia hirta L. Asian Pac J Trop Med. 2011;4(5):386–90.

63. Chattopadhyay RR. A comparative evaluation of some blood sugar lowering agents of plant origin. J Ethnopharmacol. 1999;67(3):367–72.
64. Nassiri-Asl M, Hosseinzadeh H. Review of the pharmacological effects of Ocimum sanctum (Holy Basil): a review. Indian J Exp Biol. 2014;52(4):302–7.
65. Kaushik P, Goyal P, Chauhan A, Chauhan G. In vitro evaluation of antibacterial potential of dry fruit extracts of Elettaria cardamomum Maton (Chhoti Elaichi). Iran J Pharm Res. 2010;9(3):287–92.
66. Jain S, Jain P, Sharma NK. Emerging trends in herbal formulations: A review. J Drug Deliv Ther. 2021;11(4):28–34.
67. Sharma A, Shanker C, Tyagi LK, Singh M, Rao CV. Herbal medicine for market potential in India: an overview. Acad J Plant Sci. 2008;1(2):26–36.
68. Thakur N, Jain N, Jain V, Banweer J. Preparation and evaluation of herbal cosmetic face wash. Indo Am J Pharm Res. 2013;3(4):3260–4.

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