JPharmSci
Journal of Pharmaceutical Sciences
Open access peer-reviewed Journal
www.jpsjournal.com [ISSN: 1520-601x]

Design and Evaluation of Liquorice Enriched Herbal Soap for Skin Brightening and Ani-Tanning Activity

Arpit Gupta[1*], Yash Kumar Singh[2], Virendra Kumar Singh[2], Shraddha Dubey[4], Durgesh Kumar Mishra[5]

[1]Assistant Professor, Department of Pharmacology, Institute of Pharmaceutical Science and Research, Lucknow-Kanpur Express Highway, Sohramau, Unnao - 209859
[2,3,4,5]Student, Faculty of Pharmaceutical Sciences, Rama University, Mandhana, Kanpur, 209217.

ABSTRACT

The present study focusses on the development and assessment of an herbal soap with anti-tanning properties derived from natural liquorice have been explored. The natural liquorice-based anti-tanning herbal soap was formulated using the melt-and-pour method, with the use of natural materials like liquorice powder, turmeric, aloe vera gel, orange peel powder, and Multani mitti. Results obtained from the evaluation of physicochemical characteristics such as pH, foaming property, hardness, moisture content, and skin irritation showed satisfactory pH levels, appropriate foaming behavior, adequate hardness, and reasonable moisture content. The soap also exhibited efficient exfoliating capabilities along with significant anti-tanning properties. No instances of skin irritation were recorded during the evaluation process, implying that the herbal soap is free from adverse effects on the skin.

Keywords: Aloe vera, Liquorice powder, Turmeric powder, orange peel powder.

INTRODUCTION

1.1 SKIN:

The skin is the largest organ in the body, accounting for over 15% of an adult's total weight. The skin in the human body functions as a barrier to protect from external influences such as bacteria, chemicals, and mechanical damage. It has three major layers: epidermis, dermis, and hypodermis. The skin plays an important role in regulating body temperature and immunity. Skin protects the

body from dehydration and external effects. Proper skin care is necessary for its normal functioning. **[1,2]**

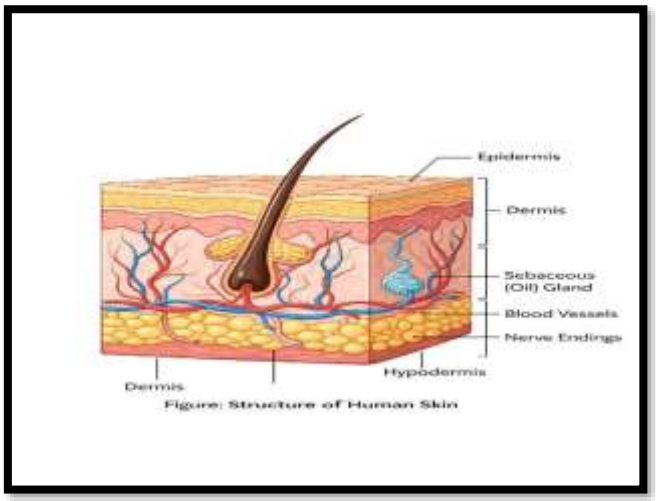


Figure: Structure of Human Skin

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.

1.1.1 TYPES OF SKIN

There are four types of skin

1.1.1. 1Dry Skin: Low moisture in dry skin makes it appear dry and tight and even rough. It also appears dull and dehydrated. Dry skin brings about discomfort and increased sensitivity, causing irritation. Many things may lead to dry skin such as environment, hereditary, aging and dehydration. Moisturizing regularly helps replenish moisture in the skin and protect its skin barrier from dermatitis or an itchy scalp that can result from extremely dry skin.

1.1.1.2 Oily Skin: Oily skin is characterized by excess production of sebum especially on the time (forehead, nose and chin). Due to excess oiliness, the pores get blocked hence increasing the likelihood of having big pores, pimples, blackheads and whiteheads. Despite being more prone to acne, oily skin is good at protecting against wrinkles and fine lines since it grows slowly.

1.1.1.3 Normal Skin: The normal skin is healthy. It is well hydrated, smooth and elastic. It is unlikely that normal skin suffers from any skin problems since it is not oily nor dry.

1.1.1.4 Combination Skin: This type is made up of dry and oily skin types. It is among the commonest skins where oily skin shows on the t-zone (forehead, nose and chin) while other parts have normal or dry skin**.[3]**

1.1.2 Layers of skin:

It has three main categories

1.1.2.1 The Epidermis Layer -The skin's outermost layer, known as the Epidermis, acts as the body's first line of fight against external chemicals.

1.1.2.2 The Dermis Layer-Gives shape and flexibility to the Epidermis and maintain it.

1.1.2.3 The Hypodermis – Subcutaneous layer, is composed of muscles, adipose tissue.**[4]**

1.1.3 Functions of skin

1.1.3.1 Protection of skin: The skin's Langerhans cells, which are a component of the adaptive immune system, act as an antimicrobial barrier to prevent infections and harm between the inside andthe outside.

1.1.3.2 Sensation: It contains sensory receptors that help in detecting touch, pain, pressure, and temperature.

1.1.3.3 Heat regulation: Because the skin's blood supply is far greater than what it needs, it is capable of controlling how much energy is released by heating, cooling and conduction.constructed blood vessels significantly lower cutaneous blood flow and kept heat, whereasdilated blood vessels increaseflow and lose heat.

1.1.3.4 prevention of water loss: helps in preventing excessive loss of water from the body and maintains hydration.

1.1.3.5 Endocrine: The two layers of the Epidermis, the stratum basil and stratum spinosum, produce cholecalciferol (D3), which is one of our primary sources of vitamin D from the skin.

1.1.3.6 Water resistance: To prevent essential minerals from going out of the body, the skin functionsas a water-resistant barrier. **[5,6]**

1.2 Soap

The soap is an everyday cleanser that is known to all people around the globe. **[7]** Numerous researchers have explained soap from various perspectives. According to the scientific definition, soap is a salt of fatty acids produced via the chemical reaction between fats or oils and an alkali through the saponification process. It is considered to be a surfactant with cleansing, detergent, and antimicrobial attributes. **[8,9]**

1.2.1 Herbal soap

Herbal soap is a type of soap made using natural ingredients derived from various herbs and plants. Herbal soap is a natural cleanser, which can be produced with the use of plant materials like oil, extract, and powder. The product contains some

beneficial components that promote healthy skin conditions**.[10]**

A lot of products have been adulterated and there are a lot of beauty products in the market that are not of good quality and can cause many side effects like skin rash, allergy, or even skin diseases**.[11]**

Herbal soaps are better than synthetic soaps as they are kind to the skin and have antiseptic, antioxidant, and anti-inflammatory qualities. It mainly uses parts of plants like seeds,rhizomes,leaves, flowers and pulp to treatment for an injury or disease or to achieve good health. **[12,13]**

In addition to this, no kind of artificial colours or flavors is added into the herbal soaps**.[14]**

There are some common ingredients that include natural oils, fat, alkalis used for making the soaps and other herbal materials including neem, aloe vera, turmeric and many more. These ingredients are combined through processes like saponification or melt and pour method**.[10]**

1.3 Plant profile

1.3.1 Multani mitti

1.3.1.1 synonyms– Bleaching clay, Bentonite clay

1.3.1.2 Biological sources: It is a natural earthy substance, composedmainly of hydrous aluminium silicates with varying amounts of magnesium, calcium, iron and other minerals.

1.3.1.3 chemical constituents: Aluminium silicate ($Al_2Si_4O_{10}(OH)_2.nH_2O$), Magnesium silicate, calcium carbonate, Ironoxide, Kaolinite,Montmorillonite,Quartz(trace amounts), water(bound moisture)

1.3.1.4 Organoleptic properties:

- Appearance: Fine,soft,earthy powder
- Colour: pale brown, Yellowish-brown, or grayish
- Odour: Earthy, natural clay- like smell
- Taste: Earthy,bland(not generally tasted)
- Texture: smooth,silky,powdery to touch **.[15]**



Fig 1 - Multani Mitti Powder



Fig 2 - Orange Peel Powder

1.3.2 Orange peel powder

1.3.2.1 Synonyms: SantraChilka powder ,orange rind powder.

1.3.2.2 Biological source: orange peel powder is obtained from the dried outer pericarp(peel) of the fruit of citrus sinesis (L) Osbeck, commonly known as sweet orange.

1.3.2.3 Chemical constituents: Flavanoids(e.g: hesperidine,narirutin,naringin), vitamin C (ascorbic acid), essential oils (mainly limonene, linalool,citral), tannins ,pectin,caretenoids,phenolic acids(e.g., ferulic acid, caffeicacid), Minerals(calcium, potassium, magnesium) **[15]**

1.3.2.4 Organoleptic properties:

- Appearance: Fine dry powder
- Color: Yellow to light orange
- Odour:pleasant, fresh citrus fragrance
- Taste: slightly bitter and tangy
- Texture: slightly coarse to fine , depending on grind size **.[16]**

1.3.3 Aloe vera Gel

1.3.3.1 synonyms: Aloe gel, true aloe, Aloe barbadensis.

1.3.3.2 Biological source: The gel or mucilage is extracted from the parenchymatous tissue of the leaf pulp,while Aloe latex is a bitter yellow exudate from the pericyclic cells beneath the leaf skin **.[17]**

1.3.3.3 chemical constituents: polysaccharides, Glycoproteins,vitamins,enzymes.

1.3.3.4 Organoleptic properties:

- Appearance: Transparent to slight opaque gel;thick fleshy green leaves
- Color:Gel- clear to pale yellow ,leaf-green
- Odour:Mild, Earthy or glassy smell
- Texture:slippery,mucilaginous (gel); firm and waxy (leaf surface)**[18]**



Fig 3 - Aloevera

1.3.4 Turmeric powder

1.3.4.1 synonyms:Hldi(Hindi),Curcuma,Indian saffron .

1.3.4.2 Biological source: Turmeric powder is obtained by drying and grinding the rhizomes of the plant Curcuma Longa**.[19]**

1.3.4.3chemicalconstituents:Curcuminoids,volatile oils,proteins,tannins,sugar.

1.3.4.4 Organoleptic properties:

- Appearance:Fine powder
- Color:Bright yellow to orange-yellow
- Odour:characteristic,warm, Earthy, slightly woody
- Taste:bitter, slightly pungent,earthy
- Texture :Fine,dry, slightly gritty **.[20]**



Fig 4 - Turmeric powder

1.3.5 Liquorice powder

1.3.5.1 Synonyms: Liquorice is commonly known as mulethi, yashtimadhu, sweet root, and radix glycyrrhizae**.[21]**

1.3.5.2 Biological source:Liquorice consists of the dried roots and stolons of Glycyrrhiza glabra, belonging to the family Fabaceae.[**22]**

1.3.5.3 chemical constituents:Liquorice contains glycyrrhizin as the main active constituent.

Other constituents include saponins, sugars, and amino acids**.[23]**

It Also contains flavonoids such as liquiritin, isoliquiritin, and glabridin**.[22]**

1.3.5.4 Organoleptic properties:

- Appearance:coarse to fine powder
- Color:Liquorice root is yellowish-brown in colour.
- Odour:It has a characteristic odour .
- Taste: sweet
- Texture: The texture of the root is fibrous in nature.**[21,22]**



Fig 5 - Liquorice powder

1.4 Aim of the study

The aim of the present study is to formulate and evaluate a natural liquorice-based herbal anti-tanning soap using selected herbal ingredients for effective skin care.

1.5 Objective of the study

- To select suitable herbal ingredients such as liquorice, turmeric, aloe vera, orange peel powder, and Multani mitti for formulation.
- To prepare herbal anti-tanning soap using the melt-and-pour method.
- To evaluate physicochemical properties such as pH, foaming ability, hardness, and moisture content.
- To study exfoliation efficiency and anti-tanning activity of the formulated soap.
- To assess the safety and skin compatibility using patchtest.

2. REVIEW OF LITERATURE

2.1 (Kumar et al., 2022) carried out research on natural substances that were employed for anti-tanning and depigmentation. In this regard, it was stated that herbal substances such as liquorice had active components such as glabridin, which assist in inhibiting melanin synthesis. Natural substances not only make the skin look more beautiful but also lighten the skin by inhibiting its pigmentation. In addition, herbal substances have been considered as safe substances compared to chemical products. Liquorice contains antioxidant substances which play an important role in skin lightening.

2.2 (Wahab et al., 2021) It has been reported to contain biologically active substances like glycyrrhizin and glabridin, which possess antioxidant, anti-inflammatory, and skin-lightening effects. This makes it suitable for inclusion in cosmetic products. And aids in skin lightening.

2.3(Pastorino et al., 2018) researched the chemical and medicinal attributes of liquorice and found that liquorice is crucial in decreasing hyperpigmentation and shielding the skin from ultraviolet radiation exposure.

2.4 (Mukherjee et al., 2017) This report examined the cosmetic properties of herbal products. The study indicated that herbal products are stable and compatible with the skin. It is clear from the findings that natural substances make cosmetic products safe and effective. The products proved to be suitable for use over an extended period without causing any irritation. Moreover, it was noted that the popularity of herbal cosmetics is growing owing to their healing qualities.

2.5 (Choudhary & Patel 2020)it reported that herbal preparations are better options for skincare products. It was found that herbal preparations do not cause skin irritation and other negative reactions. It was noted that herbal products suit various skin types. Herbal preparations offer effective treatment and cosmetic properties. Increasing demand for herbal cosmetics is being observed nowadays. Thus, herbal preparations are recommended for skincare products.

2.6 (Anandaraj et al., 2021) studied the foaming behavior and cleansing potential of herbal soap and found that soap made from natural surfactants is effective in lather formation and cleansing without causing any skin irritation.

2.7 (Dhanasekaran 2016) According to the research, the use of herbs in the formulation of soap increases the effectiveness and quality of the product. The findings showed that the herbal soaps increase the nourishment and hydration of the skin. The results indicated that there were no side effects associated with the use of herbal soaps.

3. PREFORMULATION STUDY

The pre-formulation studies were performed to determine the physical and chemical properties of the ingredients, their compatibility, and the purpose they serve in formulating the herbal exfoliating soap. These steps guaranteed that safe, stable, and effective ingredients would be selected based on their potential skin benefits.**[25]**

3.1 selection of herbal ingredients

The following natural substances were chosen based on their traditional use, pharmacologicalprofile, and skin care functionality:

Table no. 1.1

Sr.no	Ingredients	Nature	Functional role
1.	Multani mitti	Natural clay	Absorbent,removes excess oil ,detoxifies skin.
2.	Orange peel powder	Citrus fruit peel	Rich in vitamin c,lightens tan , exfoliates dead skin.
3.	Liquorice	Powder	Anti tanning ,skin soothing, Antioxidant
4.	Aloe Vera gel	Plant extract	Soothes skin, moisturizes,heals UV- induced damage
5.	Turmeric powder	Rhizome powder	Anti-inflammatory,Anti tanning , Antioxidant

3.2 Organoleptic properties

Each ingredient was visually and physically evaluated for its color,odour, Texture and flowability to ensure it would integrate well in the final formulation:

Multani mitti :Light brown,fine powder,earthy odour.

Orange peel powder:Bright orange brown,citrus scent

Aloe vera gel:Clear,mucilaginous, neutral odour.

Turmeric powder:bright yellow,distinct spicy scent.

Liquorice powder: Yellow-brown powder , characteristic odour**[24,25]**

3.2 Solubility and dispersibility

All ingredients were tested for solubility and dispersibility in water and molten glycerine soap base.

Multani mitti and turmeric:Insoluble but well dispersible**.[26]**

Orange peel powder:Insoluble,forms uniform suspension.

Aloe vera gel:Soluble in aqueous phase ,miscible with molten soap base.

Liquorice powder: it is freely soluble in water and produces good lather, indicating effective cleansing properties.

Conclusion: Ingredients with insolubilty were still suitable for exfoliating or tropical activity, a physical distribution is more important than complete solubility in this context. **[27,25]**

3.4 compatibility testing

To avoid any undesirable interactions or instability, individual ingredients were mixed with the soap base and observed for:

Colour change

Clumping or separation

Precipitate formation

Unpleasant odour development

Result: No incompatibility were observed over 48 hours of standing at room temperature ,indicates all selected herbal ingredients are physically compatible with the base**.[28]**

4. METHODOLOGY

4.1 procurement of materials

All types of ingredients such as Multani mitti, dried orange peel powder, fresh leaves of Aloe Vera, Liquorice powder and turmeric powder have been procured from authentic sources. The melt and pour glycerine soap base has been chosen as the main component as it is easy to formulate, safe for the skin and clear in nature that gives an aesthetic look. Essential oils and colorants have been procured from the certified sources.**[29]**

- **Liquorice Powder (Glycyrrhiza glabra)**The liquorice root extracts were thoroughly cleaned to get rid of any impurities, and then, the dried roots were left for 7 to 10 days. These dried roots were grounded into a fine powder using an electric grinder. This powder was further passed through a 60 mesh sieve to attain the required particle size**.[22]**

- **Orange peel powder :**The peels from fresh oranges were cleaned and air-dried for 7 to 10 days. They were then powdered and sieved using a 60-mesh sieve to make sure that the particles were uniformly sized.

- **Aloe vera gel :**The fresh leaves of aloe vera were washed properly, and then the skin of the leaves was peeled off. The extracted gel was taken under hygienic conditions and processed by a homogenizer to prepare an even gel.

- **Turmeric powder :** The turmeric rhizomes were washed and dried, then reduced to a fine powder. The fine powder was sieved to eliminate large particles.

- **Multani mitti:**The Multani mitti was used without any further purification and was sieved to get rid of any large particles.**[30]**

4.3 Formulation procedure

The herbal soap was produced by the melt-and-pour technique. The soap base was chopped into small pieces and then melted in a double boiler system, ensuring that it was not heated directly. The temperature was controlled at 50–60°C to incorporate heat-sensitive herbal additives**.[31]**

The following Quantities were added gradually under continuous stirring :

- Liquorice powder:1-2% w/w
- Multani mitti: 1% w/w
- Turmeric powder: 0.5% w/w
- Orange peel powder: 1% w/w
- Aloe vera gel: 3% w/w[32]

4.4 **Moulding and solidification**

The homogenous soap mixture was carefully poured into pre-sanitized silicon molds .The molds were allowed to cool and solidify at room temperature (25±2°C) for 24 hours.No refrigeration was used to avoid condensation- related defects**.[33]**

5. EVALUATION OF FORMULATED SOAP

To access the quality, safety and performance of the formulated herbal exfoliating soap ,the following physicochemical ,functional, and dermatological evaluations were conducted:

5.1Organoleptic evaluation

The soaps were visually inspected and physically inspected for :

5.1.1 color: Uniform distribution of colour with no fading or discoloration.

5.1.2**Texture:**smooth, consistent appearance with well-dispersed exfoliates particles

5.1.3**Odour:** Acceptable fragrance ,preferably derived from natural ingredients or essential oils.

5.1.4 **Appearance:** Absence of air bubbles ,cracks or sweating . Semi transparent to opaque finished based on herbal contents .

5.2 pH determination

A 1% w/v aqueous soap was prepared using distilled water .

The pH was measured using a calibrated pH meter at room temperature .

Ideal range:pH 5.5-7.0 to maintain skin's natural acid mantle .

The formulation was found to have a pH of approximately 6.2 ± 0.1, suitable for regular dermal use .

5.3 Foam height and foaming ability

Foaming capacity was measured using a shake flask method :

1 g of soap was dissolved in 50 ml of distilled water and transferred to a 100 mL. measuring cylinder .

The solution was shaken for 10 seconds and allowed to standfor 1 minute

The foam height was measured in centimetres.

Observations was made for: initial foam height foam stability after 5 minutes .

5.4 Hardness and consistency

The measurement of soap hardness was carried out using the penetrometer test or thumb test to assess deformability.

An excellent exfoliating soap must be somewhat hard to maintain shape, but soft enough to facilitate easy application.

Conclusion: The tested soap had the appropriate hardness level.

5.5 Moisture Content and Weight Loss on Drying

5 g of freshly made soap was then weighed and put in an oven set at 105°C for two hours.

The amount lost was noted and the percentage moisture content determined.

Too much moisture (above 15%) can cause contamination by microorganisms or shorten the soap's shelf life.

5.6 Exfoliation Efficiency

The efficiency of exfoliation was assessed by the manual rubbing test:

Subjects rubbed the soap over wetted forearm with round movements for 30 seconds.

This place was then washed off and dried. Removal of the dead skin, smoothness and touch sensation were noted.

The score of subjective assessment was received via 5 point scale from:

1 (not at all exfoliated) to 5 (perfectly exfoliated)

5.7 Skin Irritation / Patch Test

Conducted on 10 healthy volunteers (after obtaining informed consent).

A small amount of soap was applied to a 1 cm^2 area on the inner forearm and left for 15–20 minutes. **[34]**

6. RESULTS

The plant-based exfoliating soap was successfully formulated using natural ingredients including Liquorice powder, Multani mitti, orange peel powder, aloe vera gel, turmeric, and coffee grounds. The formulation was prepared using the melt-and-pour method, and the resulting soap was evaluated for various physicochemical and dermatological parameters. The observations are summarized below:

6.1 Physical Appearance

The formulated soap exhibited an aesthetic light brown color with a uniform texture and smooth surface. Exfoliating particles were evenly dispersed, and the soap maintained a pleasant natural aroma, primarily contributed by the herbal ingredients and essential oil.

6.2 pH Analysis

The pH of the soap solution (1% w/v in distilled water) was found to be 6.2 ± 0.1, which falls within the ideal skin-compatible range of 5.5 to 7.0, indicating its suitability for topical use without disturbing the natural acid mantle of the skin.

6.3 Foaming ability

The soap generated high-quality foam with a mean initial height of 4.5 cm that did not drop below 3.5 cm within the first 5 minutes, indicating sufficient foaming power for consumer satisfaction.

6.4 Hardness and Consistency

The soap exhibited moderate hardness, ensuring that it retained its shape during handling and storage. It was not brittle and allowed comfortable grip and application, making it ideal for regular exfoliating use.

6.5 Moisture Content

The moisture content of the soap was found to be 11.8%, which is within acceptable limits. This ensures good shelf stability while maintaining a hydrating texture during application.

6.6 Exfoliation Efficiency

The rubbing test indicated good exfoliating performance. More than 85% of the subjects (n=10) felt that dead skin cells were removed successfully, and their skin felt smooth and refreshed post-application. The exfoliation effectiveness scale was 4.6 out of 5.

6.7 Anti-tanning Effectiveness

Within seven days of continuous usage, more than 70% of the volunteers experienced noticeable improvement in skin complexion and fading of the tan, especially in areas exposed to sunlight. The natural anti-inflammatory and melanin-balancing action of turmeric and orange peel facilitated these results.

6.8 Skin Irritation Test

There was no erythema, irritation, or rash observed among the volunteers (n=10) during the patch test for 48 hours. The result proves that the herbal soap is not an irritant to the skin.

7. CONCLUSION

This study has successfully formulated an anti-tanning herbal soap using various ingredients like liquorice powder, turmeric, aloe vera, orange peel powder, and Multani mitti. The soap formed by using the melt and pour method possesses adequate physicochemical characteristics in terms of pH, foaming capability, hardness, and moisture content. This formulation demonstrates excellent exfoliating activity and also proves useful for treating tan. There is no evidence of skin irritation, which means that this formulation is safe for external use. It has been made from all-natural ingredients; therefore, it is a good substitute for synthetic soaps. In conclusion, this herbal soap is effective and beneficial for skin health.

REFERENCES

1. Komitakis, J. (2002). Anatomy, histology and immunohistochemistry of normal skin. European Journal of Dermatology, 12(4), 390–401.
2. Holloway, S., & Mahoney, R. (2020). Periwound skin care considerations for older adults. British Journal of Community Nursing, 25(Suppl), S26–S33.
3. Parraga, S. P. (2024). Skin type classifications: Does the perfect assessment exist? Clinical and Experimental Dermatology.
4. Waugh, A., Grant, A., & Ross, J. S. (2002). Ross and Wilson anatomy and physiology in health.
5. Yuan, S., et al. (2025). Extracellular vesicles in skin: Biological function and therapeutic potential. International Journal of Nanomedicine.
6. Madison, K. C. (2003). Barrier function of the skin: "La raison d'être" of the epidermis. Journal of Investigative Dermatology, 121(2), 231–241.
7. Pius, A., & Anyibe, T. (2017). Anti-microbial qualities of ABUAD moringa soap. Slovak Journal of Food Sciences, 11(1), 550–557.
8. Dudhat, K. (2024). Exploring innovations in soap and syndet bar formulations: A comprehensive review. Journal of Pharmaceutics and Pharmacology Research, 7(7).
9. Hari Prasath, R. (2023). Herbal soap of Curcuma amada Roxburgh and Prunus dulcis. Asian Journal of Pharmaceutical and Clinical Research, 16(4).
10. Das, S., Agarwal, S., Samanta, S., Kumari, M., & Das, R. (2024). Formulation and evaluation of herbal soap. Journal of Pharmacognosy and Phytochemistry, 13(4), 14–19.
11. Anen, S. K. (2023). Formulation and evaluation of herbal soap. World Journal of Pharmaceutical Research, 12(9), 2136–2147.
12. Ghonge, P. G., Hatwar, P. R., Shelke, P. G., Bakal, R. L., & Khandare, S. S. (2025). Herbal soaps in skincare: Natural solution for healthy skin. GSC Biological and Pharmaceutical Sciences.
13. Umesh-Idika, A., & Maduakor, M. (2013). Soap production using waste materials of cassava peel and plantain peel ash as an alternative active ingredient. IOSR Journal of VLSI and Signal Processing, 3(3).
14. Dhanasekaran, M. (2016). International Research Journal of Pharmacy, 7(2), 31–35.
15. Anandaraj, M., Subramanian, R., & Lakshmanan, R. (2021). Evaluation of foaming and cleansing properties of natural surfactant-based herbal soaps. International Journal of Cosmetic Science, 43(2), 145–151.
16. Choudhary, R., & Patel, H. (2020). Herbal formulations: A safer alternative for skin care. Journal of Dermatological Research, 13, 22–29.
17. Kumar, V., Rani, P., & Sharma, S. (2022). Natural agents for anti-tanning and depigmentation: A review. Journal of Herbal Medicine, 30, 100499.
18. Mukherjee, P. K., Bahadur, S., & Horwansh, R. K. (2017). Evaluation of cosmetic properties of herbal products. Journal of Ethnopharmacology, 199, 39–45.
19. Panja, P., Roy, D., & Biswas, M. (2020). Natural aroma and its impact in herbal cosmetic formulation. Asian Journal of Beauty and Cosmetology, 18(3), 143–150.
20. Patel, A., Shah, R., & Sharma, D. (2019). Moisture retention and shelf stability of herbal soap formulations. Journal of Cosmetic Science, 70(4), 295–302.
21. Lim, T. K. (2015). Glycyrrhiza glabra. Edible Medicinal and Non-Medicinal Plants.
22. Pastorino, G., Cornara, L., Soares, S., Rodrigues, F., & Oliveira, M. B. P. P. (2018). Liquorice (Glycyrrhiza glabra): A phytochemical and pharmacological review. Phytotherapy Research.
23. Wahab, S., et al. (2021). Glycyrrhiza glabra (licorice): A comprehensive review on its phytochemistry and pharmacology. Frontiers in Pharmacology.
24. Bhowmik, D., Chiranjib, K., Yadav, J., Tripathi, K. K., Kumar, K. P. S., & Chandira, M. R. (2010). Herbal cosmetics: A comprehensive review. Research Journal of Medicinal Plants, 4(1), 24–33.
25. Tupe, A. S., Ghaywat, S. K., Gaikawad, N. B., Agrwal, S. R., & Mohan, R. S. (2025). Preparation and evaluation of herbal soap from licorice root powder. International Journal for Research Trends and Innovation.
26. Foster, S., Johnson, R. L., & Low Dog, T. (2011). National Geographic guide to medicinal herbs: The world's most effective healing plants. National Geographic Books.

27. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. (2014). Pharmacognosy (50th ed.). Nirali Prakashan.
28. Pattanayak, S., Behera, P., Das, D., & Panda, S. K. (2012). Aloe vera: A valuable wonder plant for food, medicine and cosmetic use—A review. Journal of Biological Sciences, 12(1), 27–38. https://doi.org/10.3923/jbs.2012.27.38
29. Barel, A. O., Paye, M., & Maibach, H. I. (2014). Handbook of cosmetic science and technology (4th ed.). CRC Press.
30. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. (2014). Pharmacognosy (50th ed.). Nirali Prakashan.
31. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. (2014). Pharmacognosy (50th ed.). Nirali Prakashan
32. Panda, S., Singh, S., & Ghosh, G. (2020). Extraction and evaluation of phytoconstituents from Citrus sinensis peel. International Journal of Pharmacognosy and Phytochemical Research, 12(1), 12–17.
33. Patel, V., Desai, T., & Shah, P. (2019). Evaluation of coffee-based scrub for skin exfoliation. International Journal of Cosmetic Science, 41(4), 356–361. https://doi.org/10.1111/ics.12524
34. Anandaraj, M., Subramanian, R., & Lakshmanan, R. (2021). Evaluation of foaming and cleansing properties of natural surfactant-based herbal soaps. International Journal of Cosmetic Science, 43(2), 145–151. https://doi.org/10.1111/ics.12689.

HOW TO CITE: Arpit Gupta, Yash Kumar Singh, Virendra Kumar Singh, Shraddha Dubey, Durgesh Kumar Mishra, Design and Evaluation of Liquorice Enriched Herbal Soap for Skin Brightening and Ani-Tanning Activity J. Pharm. Sci., 2026, 2 (6), 484-494. https://doi.org/10.5281/zenodo.20774647