

FORMULATION AND EVALUATION OF HERBAL FACE SERUM FOR HYPERPIGMENTATION

Sayali B. Umap¹, Anil B. Panchal*¹, Dr. Sampat D. Navale²

¹B. Pharm Student, Delight College of Pharmacy, Pune, Maharashtra, India-412216.

^{1*} Assistant Professor, Pharmaceutics Department, Delight College of Pharmacy, Pune
Maharashtra, India-412216.

²Principal (Professor), Pharmacognosy Department, Delight College of Pharmacy, Pune
Maharashtra, India-412216.

Article Received on 30 April 2026,

Article Revised on 21 May 2026,

Article Published on 01 June 2026,

<https://doi.org/10.5281/zenodo.20442255>

*Corresponding Author

Anil B. Panchal

Assistant Professor, Pharmaceutics
Department, Delight College of
Pharmacy, Pune Maharashtra, India-
412216.



How to cite this Article: Sayali B. Umap¹, Anil B. Panchal*¹, Dr. Sampat D. Navale². (2026). Formulation and Evaluation of Herbal Face Serum For Hyperpigmentation. World Journal of Pharmaceutical Research, 15(11), 913-924.

This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

Effective and natural cosmetic formulations are becoming more and more popular since radiant and even-toned skin is a crucial sign of healthy skin. The creation and assessment of a herbal face serum enhanced with plant-based extracts to improve skin look and encourage a uniform complexion are the main objectives of this study. Natural substances with skin-brightening, antioxidant, and moisturizing qualities, like aloe vera, licorice root extract, and pomegranate peel extract, were used to make the serum. The developed serum's suitability for topical application was confirmed by evaluation parameters such as pH-6.5, viscosity -500cp, spreadability -10.33gm/sec, stability, and skin compatibility. The results showed that the herbal face serum offers enhanced skin hydration, improved texture, and a visibly radiant glow. This study highlights the

potential of herbal formulations as safe, effective, and consumer-friendly alternatives in modern skincare.

KEYWORD: Herbal Face serum, Hyperpigmentation, Licorice Root, Skin, Skin protection.

INTRODUCTION

A skin condition known as hyperpigmentation causes some parts of the skin to look darker

because of increased melanin deposition. Inflammation, age, hormonal changes, post-acne marks, and excessive sun exposure are major causes. For both men and women, pigmentation issues and uneven skin tone are serious cosmetic concerns. While there are a number of synthetic pigmentation treatments available, long-term usage of chemical-based solutions may result in adverse effects such as skin sensitivity, dryness, redness, and irritation.^[1]

Natural skincare formulas with increased efficacy and safety have been developed as a result of the rising demand for herbal cosmetics. Flavonoids, tannins, alkaloids, glycosides, phenolics, and vitamins are among the bioactive substances found in herbal components that have antioxidant and skin-protective qualities. These phytoconstituents aid in lowering oxidative stress, shielding skin cells from harm, and naturally regulating the production of too much melanin.^[2,3]

Face serums have become more and more popular among various cosmetic preparations due to their lightweight texture, quick absorption, and efficient delivery of active ingredients into the skin. Herbal face serums hydrate, nourish, and revitalize the skin's surface without leaving it oily. Serums are thought to be helpful for enhancing skin texture, preserving moisture balance, and minimizing noticeable pigmentation because of their concentrated nature.^[4]

Because they are affordable, biocompatible, and appropriate for long-term use, natural plant extracts are frequently used in cosmetic compositions. Antioxidant-enriched herbal medicines aid in reducing the damage caused by free radicals brought on by UV light and environmental contaminants. An other method for attaining healthier, more radiant skin with a lower chance of negative responses is the use of herbal substances in cosmetic formulas.^[5,6]

The goal of the current study was to create and assess a herbal face serum with antioxidant and skin-brightening properties for the treatment of hyperpigmentation. To ascertain the formulation's quality, safety, and efficacy, the produced serum was assessed for a number of physicochemical and phytochemical characteristics, including appearance, pH, viscosity, spreadability, washability, stability, skin irritation, and phytochemical screening.^[7,8]

PATHOPHYSIOLOGY OF HYPERPIGMENTATION

Melanocytes in the basal layer of the epidermis produce too much melanin, which causes hyperpigmentation. Melanogenesis is the process by which the enzyme tyrosinase transforms L-tyrosine into melanin. Tyrosinase activity is increased by a number of factors, including

oxidative stress, inflammation, hormonal imbalance, and ultraviolet (UV) radiation, which results in dark areas on the skin. Persistent pigmentation is also a result of increased melanosome transfer to keratinocytes.^[9,10,11]



MATERIAL

Licorice root, pomegranate peel, Aloe vera collected from local area of Koregoan Bhima. Other excipient, such as Rose water, Vitamin E, Glycerin, Sodium benzoate, Distilled water gifted by the Delight College of Pharmacy, Koregoan Bhima.

METHODS

Soxhlet Extraction

Take pomegranate peels, shade dry them and make a powder using Morter and pestle. Place the powder in Soxhlet thimble. Add methanol for pomegranate peels to the round bottom flask and assemble the Soxhlet setup. Extract Continuously for 3 to 4hours. Concentrate the extract using a water bath a 40-50 degree. Repeat the same procedure for Licorice and Aloe Vera for getting extract.

Phytochemical Screening

Test for Alkaloids (Mayer's Test)

Withdraw 2 ml of plant extract in a test tube.

Use a few drops of dilute hydrochloric acid and warm gently.

Filter the solution.

Mix 2–3 drops of Mayer's reagent to the filtrate.

Test for Flavonoids (Alkaline Reagent test)

Withdraw 2 ml of plant extract in a test tube.

Use a few drops of 10% NaOH solution.

Add 2–3 drops of concentrated HCl along the side of the test tube.

Test for Tannins (Ferric Chloride Test)

Withdraw 2 ml of plant extract in a test tube.

Use a few drops of 5% ferric chloride solution.

Test for Saponins (Foam Test)

Withdraw 2 ml of plant extract in a test tube.

Mix 5 ml of distilled water.

Shake vigorously for 2–3 minutes.

Test for Glycosides

Withdraw 2 ml of plant extract.

Mix 2 ml of glacial acetic acid containing a trace of ferric chloride.

PREPARATION OF HERBAL FACE SERUM

Preparation of Base Solution

Rose water and a small quantity of distilled water were taken in a clean beaker. Glycerin was added slowly with continuous stirring to prepare a smooth and uniform base.

Addition of Aloe Vera Extract

Aloe vera extract was added to the prepared base and mixed properly until a homogeneous solution was obtained.

Incorporation of Herbal Extracts

Pomegranate peel extract and licorice root extract were added one by one with continuous stirring to ensure uniform mixing of active ingredients in the serum.

Addition of Antioxidant

Vitamin E was incorporated into the formulation as an antioxidant to improve the stability and protective action of the serum.

Addition of Preservative

Sodium benzoate was dissolved in a small amount of distilled water and added to the formulation to prevent microbial growth during storage.

Volume Adjustment

The final volume of the serum was adjusted to 20 ml using distilled water and stirred continuously to obtain a clear and uniform preparation.

FORMULATION OF HERBAL FACE SERUM**Table 1: Formulation table.**

Sr. No.	Name of Ingredient	Category	Required quantity
1	Pomegranate peel Extract	Active ingredient	2ml
2	Licorice root	Active ingredient	2ml
3	Aloe vera extract	Active ingredient	2ml
4	Rose water	Vehicle	5ml
5	Vitamin E	Antioxidant	0.5ml
6	Glycerin	Humectant	2ml
7	Sodium benzoate	preservative	0.5g
8	Distilled water	Vehicle	q. s. to 20ml

EVALUATION OF HERBAL FACE SERUM

The prepared herbal face serum is evaluated using standard physicochemical and stability parameters to ensure its quality, safety, and effectiveness.

Organoleptic Properties

The serum is visually examined for color, odor, clarity, and consistency to ensure uniform appearance and acceptability.

pH Determination

The pH of the formulation is measured using a digital pH meter. The ideal pH should be in the range of 5.5–6.5 to match skin pH and avoid irritation.

Viscosity

Viscosity is measured using a viscometer to determine the flow properties and spreadability of the serum.

Spreadability

A small amount of serum is placed between two glass slides, and the ease of spreading is observed to assess application performance.

Homogeneity

The formulation is checked visually and by touch to ensure uniform distribution of ingredients without lumps or phase separation.

Stability Study

The serum is stored under different conditions (room temperature, refrigerated, and elevated temperature) and observed for changes in color, pH, and consistency over time.

Skin Irritation Test

It is applied to a small area of skin (patch test) to evaluate any signs of irritation, redness, or allergic reaction.

RESULT AND DISCUSSION

Test for Alkaloids

The extract was treated with Mayer's reagent to detect alkaloids.

Table 2: Alkaloids Test.

Sr. No.	Parameter	Result
1	Mayers Test	Cream Precipitate observed

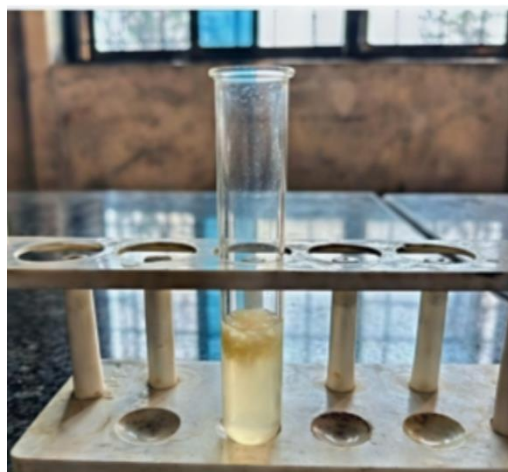


Figure 1: Alkaloid test.

Test for Tannins

The extract was treated with ferric chloride solution for detection of tannins.

Table 3: Tannins Test.

Sr. No	Parameter	Result
1	Ferric Chloride Test	Blue Black color observed



Figure 2: Tannins test.

Test for Saponins Test

The extract was shaken vigorously with distilled water and observed for foam formation.

Table 4: Saponins Test.

Sr. No	Parameter	Result
1	Foam Test	Stable foam observed



Figure 3: Saponin test.

Test for Glycoside Test

The extract was treated with glacial acetic acid and ferric chloride solution for glycoside detection.

Table 5: Glycoside Test.

Sr. No	Parameter	Result
1	Glycoside Test	Brown ring observed



Figure 4: Glycoside test.

Table 6: Organoleptic properties.

Organoleptic Test

Sr. No.	Parameter	Result
1	Color	Light green
2	Odor	Pleasant
3	Appearance	Smooth
4	Consistency	Consistency
5	Homogeneity	Homogeneous



Figure 5: face serum.

pH Determination

Table 7: pH.

Sr. No	Parameter	Result
1	pH	6.5

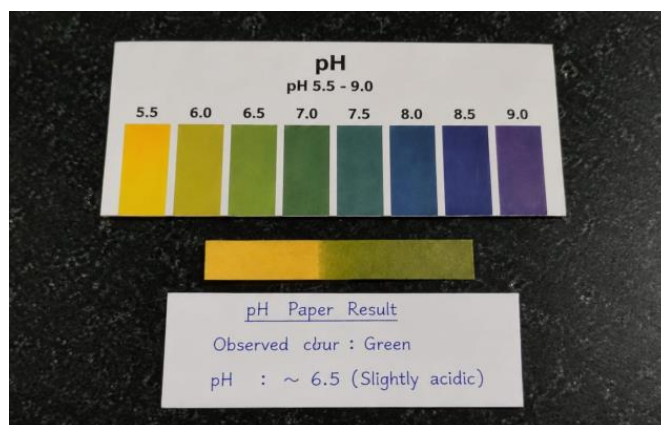


Figure 6: pH of Formulation.

Viscosity Test

Viscosity was measured using a Brookfield viscometer by rotating the spindle in the serum sample and noting the reading in centipoise (cP).

Table 8: Viscosity test.

Sr. No	Parameter	Result
1	Viscosity	500 cp

Spreadability Test

A small quantity of serum was placed between two glass slides and spreadability was evaluated by applying slight pressure.

Table 9: Spreadability Test.

Sr.No.	Parameter	Result
1	Spreadability	Easily Spreadable

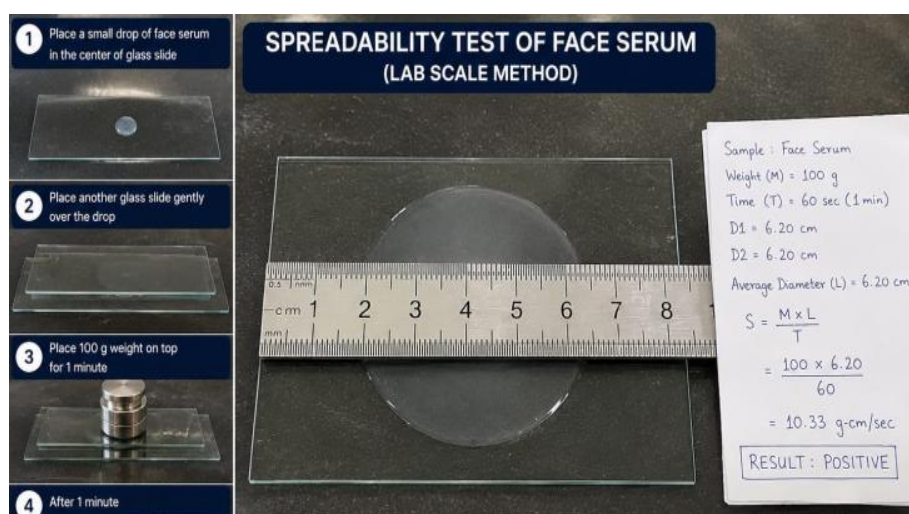


Figure 7: Spreadability Test.

Skin Irritation Test

The formulation was applied on the skin surface and observed for redness, itching, or irritation after 24 hours.

Table 10: Skin Irritation Test.

Sr. No	Parameter	Result
1	Skin Irritation Test	No Irritation Observed



Figure 8: Skin irritation test.

Washability Test

The applied serum was washed with normal water to evaluate ease of removal from the skin.

Table 11: Washability Test.

Sr. No.	Parameter	Result
1	Washability	Easily Washable

Stability Study

The formulated herbal face serum was stored at different temperature conditions such as room temperature and accelerated temperature conditions for a specified period. The formulation was observed periodically for changes in color, odor, pH, homogeneity.

Table 12: Stability Study.

Day	Storage Condition	Parameter Evaluated	Observation
Day 1	Room Temperature ($25 \pm 2^\circ\text{C}$)	Color, Odor, Ph, Viscosity	No Significant Change
Day 2	Refrigerator) ($4 \pm 2^\circ\text{C}$)	Homogeneity, Phase Separation	Stable Formulation

DISCUSSION

The phytochemical screening of the herbal face serum revealed the presence of important bioactive constituents such as alkaloids, flavonoids, tannins, saponins, and glycosides. These

phytochemicals are known for their significant therapeutic and cosmetic benefits, especially in skin care applications. The presence of flavonoids and tannins indicates strong antioxidant activity, which helps in reducing oxidative stress and protecting the skin from damage caused by free radicals. These compounds also contribute to improvement of hyperpigmentation and enhancement of skin complexion.

The alkaloids detected in the formulation may provide antimicrobial and anti-inflammatory properties, helping to reduce skin irritation and prevent microbial growth on the skin surface. Saponins present in the formulation are known for their cleansing and foaming properties, which help in maintaining skin hygiene and improving skin texture. Glycosides also contribute to skin soothing and rejuvenating effects.

The overall phytochemical evaluation confirmed that the prepared herbal serum contains various active constituents responsible for beneficial effects on the skin. Hence, the formulation can be considered effective and suitable for topical application in the management of hyperpigmentation and for improving overall skin health.

CONCLUSION

The present study concluded that the formulated herbal face serum showed satisfactory physicochemical and phytochemical properties. The formulation exhibited good appearance, suitable pH, spreadability, viscosity, and stability, making it appropriate for topical application. Phytochemical screening confirmed the presence of important active constituents such as alkaloids, flavonoids, tannins, saponins, and glycosides, which possess antioxidant, antimicrobial, and skin-protective activities.

Based on the evaluation results, the herbal face serum was found to be safe, effective, and beneficial for the management of hyperpigmentation and improvement of skin health. Thus, the developed formulation has promising potential for use as a natural skincare product with minimal side effects.

REFERENCES

1. Barel AO, Paye M, Maibach HI. *Harry's Cosmeticology*, 8th ed. New York: Chemical Publishing Company, 2009.
2. Kokate CK, Purohit AP, Gokhale SB. *Pharmacognosy*. 54th ed. Pune: Nirali Prakashan, 2018.

3. Mithal BM. Textbook of Cosmetics. New Delhi: Vallabh Prakashan, 2008.
4. Barel AO, Paye M, Maibach HI. Handbook of Cosmetic Science and Technology. 4th ed. Boca Raton: CRC Press, 2014.
5. Kapoor VP. Herbal Cosmetics for Skin and Hair Care. New Delhi: CBS Publishers, 2005.
6. Poucher WA. Poucher's Perfumes, Cosmetics and Soaps. 10th ed. Dordrecht: Springer, 2000.
7. Jain NK. Modern Cosmetics. New Delhi: CBS Publishers, 2009.
8. Sharma PP. Cosmetic Formulation, Manufacturing and Quality Control. 4th ed. New Delhi: Vandana Publications, 2011.
9. Lin JY, Fisher DE. Melanocyte biology and skin pigmentation. *Nature*, 2007; 445(7130): 843–850.
10. Pillaiyar T, Manickam M, Jung SH. Downregulation of melanogenesis: drug discovery and therapeutic options. *Drug Discovery Today*, 2017; 22(2): 282–298.
11. Briganti S, Camera E, Picardo M. Chemical and instrumental approaches to treat hyperpigmentation. *Pigment Cell Research*, 2003; 16(2): 101–110.