



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Article

Formulation and Evaluation of Herbal Paper Soap from *Punica Granatum* and *Curcuma Longa*

Afsa Philip, Aryananda P Reji, Ashifa S, Chithramol V.V, Subimol S*

Hindustan College of Pharmacy, Chenappady, Kanjirappally

ARTICLE INFO

Published: 15 Feb 2026

Keywords:

Pomegranate, Turmeric,
Paper soap, Cleansing,
Herbal, Antibacterial

DOI:

10.5281/zenodo.18650965

ABSTRACT

The present study focuses on the formulation and evaluation of herbal paper soap prepared using extracts of *Punica granatum* (pomegranate) and *Curcuma longa* (turmeric). The aim of the study is to develop an eco-friendly, portable, and skin cleansing product that combines the natural antibacterial and antioxidant properties of herbal ingredients. The paper soap was formulated by incorporating pomegranate peel extract and turmeric extract into a biodegradable, water-soluble paper base along with suitable surfactant and stabilizer. The prepared herbal paper soap was evaluated for various parameters such as pH, foam retention, moisture content, stability study. The results showed that the formulated soap possessed a balanced pH suitable for skin, good foaming properties, and effective cleansing action. The herbal extracts enhanced the antibacterial efficiency and provided additional skin-nourishing and antioxidant benefits. The study concludes that the combination of *Punica granatum* and *Curcuma longa* extracts can be successfully used in the preparation of herbal paper soap, offering a natural, safe, and sustainable alternative to synthetic cleansing products.

INTRODUCTION

Herbal paper soap is a lightweight, biodegradable made up of thin sheets of paper mixed with soap solution which incorporated with herbal ingredients that dissolve in water and produce adequate foam.⁽¹⁾ Paper soap is innovation in the field of modern toiletries and alternative to traditional soaps and synthetic products.⁽²⁾ Because, it is a portable and a pocket-sized product

for cleaning hands. This herbal soap basically consists of pomegranate peel extract and turmeric extract. They provide anti-bacterial, anti-aging, antioxidant, antiseptic effect. The herbal ingredients provide additional therapeutic benefits rather than cleansing action. The pomegranate peel contains the highest concentration of phenolic compounds which provide anti-bacterial activity and also the traces of curcumin contribute anti-inflammatory and wound healing properties.

*Corresponding Author: Subimol S

Address: Hindustan College of Pharmacy, Chenappady, Kanjirappally.

Email ✉: dr.subimol@gmail.com

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.



AIM

The aim of the project work is to formulate and evaluate the herbal paper soap containing Punica granatum and Curcuma longa for the cleansing property.

OBJECTIVES

- Perform the extraction of bioactive constituents from pomegranate peel
- Perform the extraction of curcuma longa from turmeric
- Formulate herbal paper soap using extract of pomegranate and turmeric
- Evaluate the physicochemical properties of the formulated herbal paper soap.

REVIEW LITERATURE

1. Ancy Antony, et al., (2025), reviewed that formulate and evaluate antibacterial herbal paper soap using Ocimum basilicum essential oil extracted by hydro-distillation. The biodegradable formulation was tested for pH, foam stability, spreadability, solubility, and antibacterial activity against S. aureus, E. coli, and P. aeruginosa⁽³⁾.
2. Priyanka Mandal, et al., (2021), reviewed that formulation and evaluation of herbal soap strips using neem (Azadirachta indica) for its strong antibacterial and antifungal properties. The biodegradable strips were easy to use, skin-friendly, and effective against dermal infections.
3. Joshi Naresh Dilip et al., (2019), reviewed that extracted curcumin from turmeric (Curcuma longa) using a Soxhlet apparatus with acetone as the solvent. The study demonstrated that.

curcumin has strong antibacterial, antioxidant, anti-inflammatory properties.

4. N.S.Al Zorkey et al., (2009), reviewed that Punica granatum peel extracts inhibited Staphylococcus aureus growth and reduced the production of bacterial enterotoxins.
5. Sai Prakash and Indra Prakash et al., (2017), reviewed scientific information on the chemical constituents and pharmacological activities of Punica granatum (pomegranate), with special emphasis on its juice, seed, and peel. The literature highlights that pomegranate is a rich source of bioactive compounds such as polyphenols, ellagitannins, flavonoids, fatty acids, and organic acids, which are responsible for its antioxidant, antibacterial, anti-inflammatory, and anticancer activities.

MATERIALS AND METHODS

Ingredients: Pomegranate peel extract, Turmeric extract, KOH, Glycerine, Castor oil, Coconut oil, NaCl, Citric acid, orange oil, Distilled water.

Collection: Pomegranate and turmeric were collected from local market, Kanjirappally

Equipment: The equipments were soxlet apparatus, hot air oven, digital pH meter.

Preparation of pomegranate peel extraction: The pomegranate peel was thoroughly washed with distilled water. The pomegranate peel was sun-dried for 3–4 days to preserve its natural richness, then finely ground into a soft, fragrant powder ready for formulation. Dried pomegranate peels were coarsely grinded. The weighed sample was dropped in the Soxhlet extractor apparatus. The extraction proceed for 8 hours using ethanol as the solvent.⁽⁴⁾



Preparation of turmeric extract: Take fleshy rhizomes of turmeric. The rhizomes of turmeric were dried in oven at 105°C for 3 hr. Dried rhizome were grinded and obtained uniform powder. The turmeric powder was stored in refrigerator to prevent moisture uptake.⁽⁵⁾ 10 g turmeric powder was weighed and kept in the Soxhlet apparatus which was gradually filled with acetone as the extraction solvent. The extraction was carried out at 60 °C within 8 h. After the extraction, the acetone was separated from the extract by solvent evaporation method.⁽⁶⁾

Preparation of soap solution:

- Measure 30 ml of glycerine and heat it to 60 °C.
- Weigh 8 ml of coconut oil in a beaker and gently heat it to melt the oil.
- Measure 4 ml of castor oil and add it to the melted coconut oil.
- Mix the oils by continuous stirring.
- Add the heated glycerine to the oil mixture and stir continuously.
- Prepare the alkali solution by dissolving 15 g of potassium hydroxide in 50 ml of water.
- Slowly pour the KOH solution into the oil mixture with gentle stirring.
- Heat the mixture and maintain the temperature between 60–70 °C.
- Stir continuously during heating to prevent foaming.
- If excessive foaming occurs, remove the beaker from the water bath until the foam subsides.
- Continue heating after foaming subsides.
- Heat the mixture for 2–3 hours until complete saponification occurs.
- Prepare sodium chloride solution by dissolving 16 g of NaCl in 300 ml of water.
- Add the NaCl solution to the soap mixture with continuous stirring.
- Finally, add citric acid to adjust the pH.
- Add 3.5 ml of pomegranate peel extract and 1.5 ml of turmeric extract to the fully saponified soap with continuous stirring until completely dissolved.
- Add orange essential oil to the liquid soap and mix thoroughly.
- Prepare the herbal paper soap using the dipping technique.

Table No:1 Ingredients of herbal paper soap

Sr. No	INGREDIENTS	QUANTITY
1.	Pomegranate peel extract	3.5ml
2.	Turmeric extract	2ml
3.	KOH	15 g
4.	Glycerine	30ml
5.	Coconut oil	8ml
6.	Castor oil	4 ml
7.	NaCl	16gm
8.	Cellulose paper	15 sheets
9.	Citric acid	3ml
10.	Distilled water	300ml
11.	Orange oil	3 ml



Fig .No.1: Cellulose Paper



Fig .No.2: Formulated liquid soap



Fig. No.3: Herbal Paper Soap



Fig.no.4: Herbal paper soap

RESULTS

1. Physical appearance:

Table No :2 Physical appearance

Formulation	Color	Oduor	Texture	Consistency	Grade
F1	Orange	Pleasant	Smooth	Solid	Good

2. pH:

The pH of the paper soap was found to be in the range of 6.29. As the skin have an acidic pH range

of about 4.1 to 6.7, this pH of the formulation is suitable for skin.



Fig. No.5: Image representing the pH value of the sample

3. Foam height:

The foam height of the paper soap was found to be good, indicating adequate foaming ability. On shaking the soap solution, a stable foam column

was formed, showing that the formulation possesses acceptable cleansing properties. Foam height observed was around 7.5 cm, which is suitable for hand cleansing purpose.



Fig.No.6: Picture showing the Foam height

4. Foam retention:

The foam produced by the paper soap remained stable for a considerable period. There was only a

slight decrease in foam volume after 10 minutes, indicating good foam stability. Foam retention was satisfactory, showing good stability of the formulation.

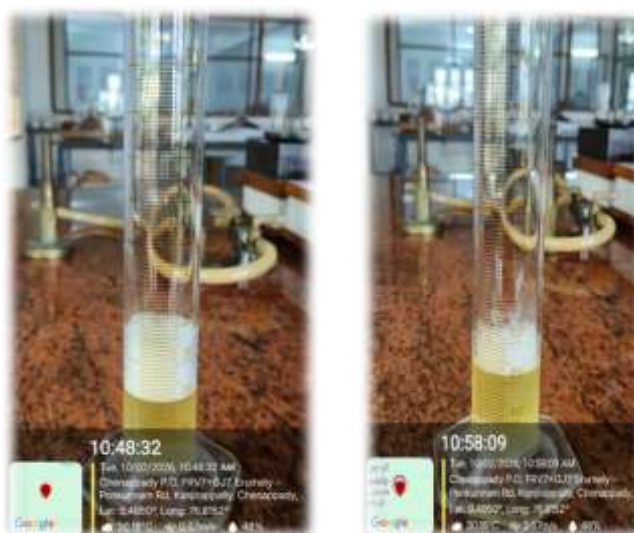


Fig.No.7: figure showing the Foam retention

5. Total Moisture Content:

The total moisture content of the prepared paper soap was determined to assess its dryness and shelf stability. The formulation showed low moisture

content, indicating good drying and reduced risk of microbial growth. Total moisture content was found 3.3% which is within acceptable limits for paper soap.

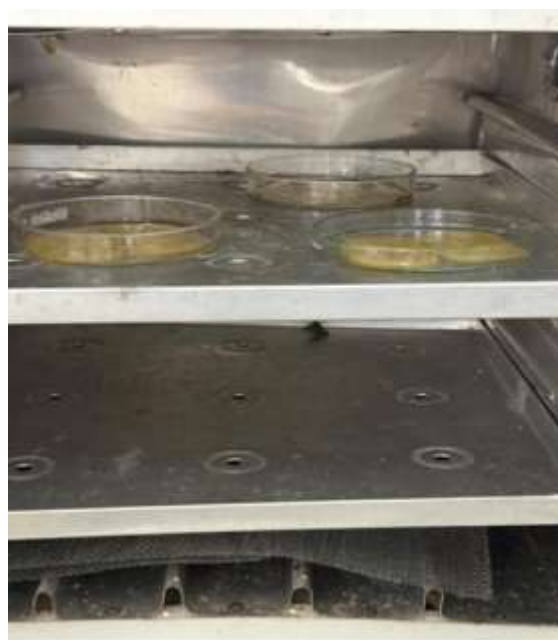


Fig.No.8: Image showing the moisture content

6. Solubility test:

The quality control test is performed to determine the time taken by the paper soap to dissolve completely and leaving without any residue. The

high quality paper dissolves within seconds 60 sec or less without any residue. the paper dissolve within 5 sec, which indicate the paper has good quality and dissolves quickly.

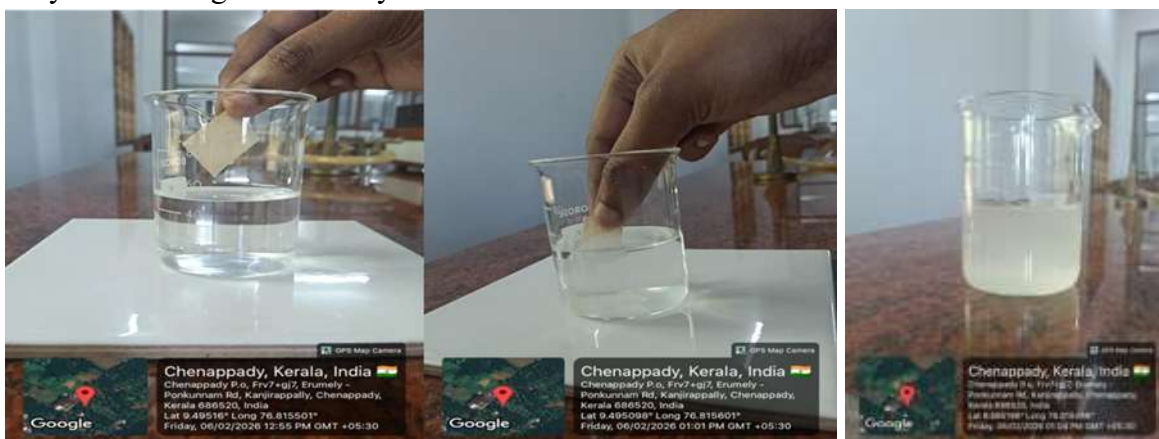


Fig.No.9: Picture showing the Determination of Solubility

Table No :3 Determination of paper solubility

Water soluble paper	Time taken to solubilize(sec)
Sample	5 sec

The spreadability of soap solution was observed as better spreadability on paper.

7. Spreadability



Fig.No.10: Determination of Paper spreadability

Table No:4 Determination of paper spreadability

Water soluble paper	Spreadability (cm)
Sample	1.9cm

8. Washability:

The test was performed to determine how easily the light weight, water soluble cellulose paper breaks down, produce foam and dissolve without remain any residue. This ensures the cleansing action and ability of paper soap to remove dirt and germs.



Fig No.11: Image showing the Determination of washability

9. Phytochemical Screening of Pomegranate Peel Extract

Table No:6 Phytochemical screening of pomegranate peel extract

Chemical test	Experiment	Observation	Inference
Test for tannins: Lead acetate test	Take 1 ml of extract of, few drops of 1% lead acetate is added to the mixture is shaken well.	Yellowish precipitate is produced 	Presence of Tannins
Foam test	To few ml of extract ,add 20 ml distilled water and allowed to continuous shaken for 10 minute.	Foam is produced. 	Presence of saponins
Million's test	To few ml of extract, few drops of millions reagent is added.	White precipitate is produced. 	Presence of protein
Test for phenol	To 2 ml of extract,3 ml of ethanol and a pinch of ferric chloride is added	Greenish yellow colour is produced. 	Presence of phenol

10. Phytochemical screening of turmeric extract

Table No:7 Phytochemical screening of Turmeric extract

Test	Experiment	Observation	Inference
Mayer's test	To 1 ml or 2 ml filtrate ,few drops of mayer's reagent are added to the sides of test tube.	creamy or white precipitate is produced. 	Presence of alkaloids
Test for glycosides	To 2 ml of test solution, added with equal quantity of fehling's solution A and B and heat the solution.	Brick red precipitate is produced 	Presence of glycosides
Test for tannins	The solution is mixed with drops of ferric chloride solution	Blue colour is observed 	Presence of gallotannins

11. Stability Test:

The stability study was carried out by storing the paper soap at room temperature and refrigerator for a specified period. During the study, the formulation was observed for changes in color, odour, texture, and physical appearance.

Table No: 8 Stability test.

Sr.no	Temperature	Stability
1	Room temperature (37°C)	Stable
2	Refrigerator (1-4°C)	stable

DISCUSSION

The project work was the formulation and evaluation of herbal paper soap from Punica granatum and Curcuma longa. The herbal paper

soap was evaluated for pH, foam height, foam retention, moisture content, and stability. The formulated paper soap (F1) showed a uniform yellowish colour with a pleasant fragrance, indicating good aesthetic quality and acceptability. It gives a smooth texture. Overall, the formulation was graded as good based on its satisfactory physical appearance. The pH of the formulated paper soap was found to be 6.29, which lies within the normal acidic pH range of human skin (4.1–6.7). This shows that the formulation is skin-friendly and does not cause significant irritation or dryness. The foam height of the formulated paper soap was observed to be approximately 7.5 cm, denoting good foaming ability. Formation of a stable foam upon shaking suggests the presence of effective surfactants. This level of foam is suitable for hand-washing applications and signifies satisfactory cleansing properties of the formulation. The foam retention study suggests that the foam produced by the paper soap remained stable with only a slight reduction in volume after 10 minutes. This reflects good foam stability and the ability of the formulation to retain foam for a sufficient duration. Satisfactory foam retention suggests that the paper soap can provide effective cleansing during use. The total moisture content of the formulated paper soap was found to be 3.3%, imply adequate drying of the formulation. Low moisture content reduces the risk of microbial growth and improves shelf stability. The observed value suggesting good product stability during storage. The quality control test revealed that the formulated paper soap dissolved completely within 5 seconds without leaving any residue. Rapid dissolution within 60 seconds is considered a characteristic of high-quality paper soap, and the observed result denote excellent solubility. This confirms that the formulation has good quality and is suitable for quick and convenient use. The spreadability of the water-soluble paper soap was found to be 1.9 cm, signifies adequate spreading

ability upon contact with water. Good spreadability ensures uniform distribution of the soap solution over the skin. The stability study of the paper soap showed no noticeable changes in color, odour, texture, or physical appearance during storage at both room temperature (37 °C) and refrigerator conditions (1–4 °C). The formulation remained stable under accelerated temperature conditions, indicating good physical stability. These results suggest that the paper soap can withstand varying storage temperatures without loss of quality. The herbal paper soap is evaluated for various phytochemical constituents such as alkaloids, tannins, phenols.. etc The test confirms the chemical constituents with positive result with the incorporation of pomegranate and turmeric extract. Overall, the results confirmed that the herbal paper soap is safe, effective, and suitable for regular hand-washing purposes.

CONCLUSION

From this result, it can be concluded that paper soap can be successfully formulated using a liquid soap base using herbal extract. The incorporation of *Punica granatum* peel extract enhanced the antimicrobial and antioxidant potential of due to the presence of bioactive compounds such as ellagic acid, gallic acid, and punicalagin. *Curcuma longa* extract, rich in curcumin, provided additional anti-inflammatory, antibacterial, and wound-healing properties, which further improved the therapeutic value of the paper soap.

The formulation showed better evaluation results in terms of foam height, foam retention, moisture content, stability study. The study confirms that herbal paper soap can be effective and safer alternative to traditional soap with reduced risk of cross contamination.

Hence, the formulated herbal paper soap using pomegranate peel extract and turmeric extract is



considered safe, effective, stable and eco-friendly and effective alternative to conventional soaps for personal hygiene.

ACKNOWLEDGEMENT

The authors express sincere gratitude to the Management of Hindustan College of Pharmacy, Chenappady, for providing necessary facilities and infrastructure to conduct this research. The authors thank Ms. Dr. Subimol. S, M. Pharm, PhD, Associate Professor, Department of Pharmaceutics, for guidance and support throughout the study. The authors also acknowledge Dr. Shiny George, Principal, for encouragement and academic support. The authors are thankful to all faculty members of the Department of Pharmaceutics for their valuable suggestions and assistance during the experimental work conducted in 2025.

REFERENCES

1. Mandal P, Upadhyay SK, Poudyal B, Sampagavi M. Formulation and evaluation of herbal paper soap. *Int J Pharm Sci Drug Anal.* 2021;1(2):4–9.
2. Ghughe S, Sahane A, Bhangare R, Phalke P, Gupta S. Formulation and evaluation of antibacterial paper soap using eucalyptus leaves. *UJMRST.* 2025;1(1):32–36
3. Antony A, Varghese AM, Sanil D, Reji M, Ramesh R. Formulation and evaluation of antibacterial herbal paper soap containing essential oil of *Ocimum basilicum* L. *Int J Pharm Res Appl.* 2025;10(1):1034–1047.
4. Chaturvedula VSP, Prakash I. Bioactive chemical constituents from pomegranate (*Punica granatum*) juice, seed and peel – A review. *Int J Res Chem Environ.* 2011;1(1):1–18.
5. Nabati M, Mahkam M, Heidari H. Isolation and characterization of curcumin from powdered rhizomes of turmeric plant marketed in Maragheh city of Iran with soxhlet technique. *Iran Chem Commun.* 2014;2(4):236–243.
6. Joshi ND, Kulkarni AA, Cherekar MN. Extraction of curcumin from turmeric by using Soxhlet unit. *ASIO J Microbiol Food Sci Biotechnol.* 2019;4(1):11
7. Patil S, Patil S, Kadam S, Adate P, Gurav N, Kamble Y. Formulation and evaluation of herbal paper soap. *Int J Pharm Sci Drug Anal.* 2021;14(8):1013–1020.
8. Faiz M, Yogi B, Gupta SK, Singh AK, Mishra S, Kumar R. Formulation and evaluation of herbal paper soap using *Sapindus mukorossi*. *E Pharm Chem J.* 2025;12(2):159–162.
9. Allwood MC, Russell AD. Mechanism of action of antimicrobial soaps and detergents *Hosp Infect.* 2003;55(1):1-7.
10. Das S, Agarwal S, Samanta S, Kumari M, Das R. Formulation and evaluation of herbal soap. *J Pharmacogn Phytochem.* 2024;13(4):14–19.
11. Joshi ND, Kulkarni AA, Cherekar MN. Extraction of curcumin from turmeric by using Soxhlet unit. *ASIO J Microbiol Food Sci Biotechnol.* 2019;4(1):11
12. Bhujbal OS, Bhosale DV, Jangam PN, Bafana YS. Formulation and evaluation of herbal soap. *Int J Multidiscip Res.* 2023;5(3):1–8.

HOW TO CITE: Afsa Philip, Aryananda P Reji, Ashifa S, Chithramol V.V, Subimol S, Formulation and Evaluation of Herbal Paper Soap from *Punica Granatum* and *Curcuma Longa*, *Int. J. of Pharm. Sci.*, 2026, Vol 4, Issue 2, 2323-2333. <https://doi.org/10.5281/zenodo.18650965>

