

FORMULATION AND EVALUATION OF A POLYHERBAL HERBAL HAIR WASH POWDER: A PRELIMINARY PHARMACEUTICAL AND COSMETIC STUDY

Vaishnavi Ramdas Pawar^{*1}, Prof. Shubham Hanumant Dhavale², Dr. Amol S. Rakte³, Dr. Sanjay Arote⁴

¹Students of IVM's Krishnarao Bhegade Institute of Pharmaceutical Education and Research, Talegaon Dabhade.

²Professor of Dr B B Khaladkar College of Pharmacy, Wakhari.

³Professor of IVM's Krishnarao Bhegade Institute of Pharmaceutical Education and Research, Talegaon Dabhade.

⁴Principal of IVM's Krishnarao Bhegade Institute of Pharmaceutical Education and Research, Talegaon Dabhade.

Article Info: Received: 04 August 2026, Revised: 24 September 2026, Accepted: 14 October 2026

***Corresponding Author: Vaishnavi Ramdas Pawar**

Students of IVM's Krishnarao Bhegade Institute of Pharmaceutical Education and Research, Talegaon Dabhade.

DOI: <https://doi.org/10.5281/zenodo.23495858>



Citation:

Vaishnavi Ramdas Pawar¹, Prof. Shubham Hanumant Dhavale², Dr. Amol S. Rakte³, Dr. Sanjay Arote⁴. (2026). Formulation And Evaluation Of A Polyherbal Herbal Hair Wash Powder: A Preliminary Pharmaceutical And Cosmetic Study. International Journal of Clinical and Pharmaceutical Innovations, 1(7), 284-289.

ABSTRACT

Background: Plant-derived powders containing saponin-rich cleansing ingredients are traditionally used for hair and scalp care. Standardized formulation and evaluation are needed before such products can be recommended as cosmetic alternatives. **Objective:** To formulate and preliminarily evaluate polyherbal hair-wash powders containing Shikakai, Reetha, Amla, Bhringraj, Neem, Fenugreek, and Hibiscus, and to compare the trial formulations with a marketed herbal hair-wash powder. **Methods:** Three powder formulations (F1–F3) were described using different proportions of Shikakai and Reetha alongside fixed or near-fixed proportions of the other botanicals. The report describes organoleptic assessment, pH of a 1% w/v aqueous dispersion, foam generation and retention, dirt dispersion, moisture content, powder-flow properties, wetting time, a human patch test, and a 60-day stability assessment. F2 contained 35% Shikakai, 25% Reetha, 15% Amla, 10% Bhringraj, 10% Neem, 3% Fenugreek, and 2% Hibiscus. **Results:** The report records pH values of 5.2 ± 0.08 , 5.5 ± 0.12 , and 5.51 ± 0.09 for F1, F2, and F3, respectively. Initial foam heights were 7.2 ± 0.3 , 7.8 ± 0.4 , and 8.1 ± 0.3 cm, with reported foam-retention values of 94.4%, 94.9%, and 95.1%. F2 was graded excellent in the reported dirt-dispersion test. The report also states a primary dermal irritation index (PDII) of 0.12 and describes small changes in pH and foam height over 60 days. These findings require verification against raw data because the report does not provide complete datasets for all stated evaluation endpoints. **Conclusion:** F2 is a candidate formulation for further standardized evaluation. The available report supports preliminary physicochemical and cleansing-performance observations, but does not by itself establish clinical efficacy, broad dermatological safety, microbiological stability, or a validated shelf life.

KEYWORDS: Polyherbal formulation; hair-wash powder; Shikakai; Reetha; cosmetic evaluation; powder formulation; stability.

1. INTRODUCTION

Hair-cleansing products are designed to remove sebum, particulate matter, and product residues from the scalp and hair. Conventional liquid shampoos commonly rely on formulated surfactant systems, whereas traditional herbal hair cleansers use plant materials such as Shikakai and Reetha, which contain saponins and other surface-active constituents.

Polyherbal powders may offer practical advantages in dry storage and reduced reliance on liquid packaging. However, their performance depends on botanical identity, raw-material quality, particle size, composition, moisture content, and storage conditions.

The supplied report describes a formulation combining *Acacia concinna* (Shikakai), *Sapindus mukorossi* (Reetha), *Embllica officinalis* (Amla), *Eclipta alba* (Bhringraj), *Azadirachta indica* (Neem), *Trigonella foenum-graecum* (Fenugreek), and *Hibiscus rosa-sinensis* (Hibiscus).

Shikakai and Reetha were assigned cleansing roles, while the remaining botanicals were included for traditional conditioning or scalp-care purposes. These traditional uses should be distinguished from demonstrated clinical effects. Claims relating to hair growth, dandruff treatment, or prevention of hair loss require specific controlled evidence and should not be inferred from basic physicochemical tests.

The aim of this work was to develop three polyherbal hair-wash powder compositions and assess selected organoleptic, physicochemical, cleansing, safety-screening, and stability parameters. The study is presented as preliminary formulation research.

2. MATERIALS AND METHODS

2.1 Materials

According to the supplied report, Shikakai pods and Fenugreek seeds were obtained from a local market in Pune; Reetha pericarp was obtained from a local market in Pune; dried Amla was obtained from a certified supplier; and Bhringraj leaves, Neem leaves, and Hibiscus flowers were collected from a garden in Talegaon.

The report states that botanical authentication was performed. However, authentication certificates, voucher specimen numbers, and the name of the taxonomist were not included in the supplied details. These details should be added before submission.

2.2 Formulation design

Three formulations, designated F1, F2, and F3, were prepared using different proportions of Shikakai and Reetha, with other botanical ingredients included at fixed or near-fixed proportions.

The composition of each formulation is shown in Table 1.

Table 1: Composition of polyherbal hair-wash powder formulations.

Ingredient (% w/w)	F1	F2	F3	Reported function
Shikakai powder	30	35	40	Primary cleanser/saponin source
Reetha powder	25	25	20	Cleanser/saponin source
Amla powder	15	15	15	Traditional conditioning/antioxidant role
Bhringraj powder	10	10	10	Traditional hair-care role
Neem powder	10	10	10	Traditional scalp-care role
Fenugreek powder	5	3	3	Conditioning role
Hibiscus powder	5	2	2	Conditioning/appearance role
Total	100	100	100	

2.3 Preparation of powder formulations

The report describes inspection and cleaning of raw materials, followed by shade-drying for 5–7 days until the moisture content was reportedly below 10%. The dried materials were ground and passed through a #60 mesh sieve.

Individual powders were weighed according to the formulation composition and blended for 30 minutes

using a stainless-steel mortar and pestle. Each formulation was prepared as a 100 g batch, transferred into labelled airtight glass containers, and stored at room temperature.

The actual drying conditions, mesh aperture, equipment details, batch numbers, and in-process moisture results should be documented from the original laboratory records.

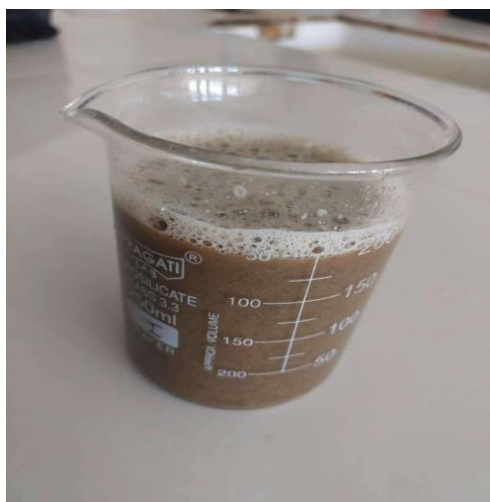


Fig. Herbal extract mixture in beaker during preparation and Herbal powder applied on skin for irritation test respectively.

2.4 Organoleptic evaluation

Colour, odour, texture, homogeneity, and feel were recorded descriptively for F1–F3 and the marketed comparator.

2.5 pH determination

A 1% w/v dispersion was prepared by dispersing 1 g of powder in 100 mL of distilled water. The mixture was stirred for 15 minutes and allowed to stand for 30 minutes.

The report states that pH was measured at $25 \pm 2^\circ\text{C}$ using a calibrated digital pH meter. Calibration was reportedly performed using buffers at pH 4.0, 7.0, and 9.2.

Measurements were reportedly performed in triplicate and expressed as mean $\pm$ standard deviation (SD).

2.6 Foam generation and retention

The report describes a modified Rossa–Miles-type test using a 1% w/v preparation in hard water with a reported hardness of 342 ppm.

A 200 mL portion was poured from a height of 90 cm into a cylinder containing 50 mL of the same preparation. Foam height was recorded immediately (FH0) and after five minutes (FH5).

The report's stated formula is ambiguous. The numerical values appear consistent with foam retention calculated as:

$$\text{Foam retention (\%)} = (\text{FH5} / \text{FH0}) \times 100$$

The original worksheet and calculations should be checked before publication, and the formula should be corrected consistently throughout the manuscript.

2.7 Dirt-dispersion assessment

The report states that 1 g of powder was mixed with 50 mL of distilled water and 0.1 mL of blue-black ink. The mixture was shaken ten times and assessed visually.

Results were graded as excellent, good, fair, or poor. The methods section refers to ink, while the results discussion also mentions mineral oil. The exact protocol and scoring rubric must therefore be reconciled and described reproducibly.

2.8 Moisture content and powder-flow properties

Moisture content was reportedly determined by loss on drying. A 1 g sample was heated at 105°C for three hours, cooled in a desiccator, and reweighed until constant mass.

Bulk density, tapped density, Carr's index, Hausner ratio, and angle of repose were listed as evaluation parameters. The supplied report does not provide a complete numerical results table for these endpoints. Values should be added only from original measurements.

The equations and calculation procedures for Carr's index and Hausner ratio should be checked against standard definitions before finalization.

2.9 Wetting time

The report describes placing powder in a Petri dish, placing a 1 cm² piece of filter paper on its surface, adding 1 mL of distilled water, and recording the time required for complete wetting.

The stated sample quantity requires clarification because the report describes approximately 100 mL of powder, which is not a reproducible mass-based quantity.

2.10 Skin irritation assessment

The report states that a 5% w/v aqueous preparation was patch-tested on 10 healthy adult volunteers, comprising six females and four males aged 20–35 years. Observations were reportedly made at 24 and 48 hours, and a PDII of 0.12 was reported.

Before publication, the following details must be supplied:

- Ethics committee name and approval number.
- Protocol registration, if applicable.
- Informed-consent process.
- Inclusion and exclusion criteria.
- Adverse-event handling procedures.
- Exact scoring method used to calculate PDII.
- Individual or summary participant data.

Human testing must not be described as ethically approved unless documented approval was obtained. The reported result does not independently establish the safety of the formulation.

2.11 Stability study

The report describes storage in airtight containers under accelerated conditions of $40 \pm 2^\circ\text{C}$ and $75 \pm 5\%$ relative humidity, and room conditions of $25 \pm 2^\circ\text{C}$ and $60 \pm 5\%$ relative humidity. Testing was reportedly performed at 0, 30, and 60 days.

Reported endpoints included appearance, pH, foam height, moisture content, and microbial load.

Complete numerical results, microbial testing methods and acceptance limits, chamber monitoring records, and replicate counts should be added. A 60-day study alone is insufficient to assign a commercial shelf life.

2.12 Comparator and cost assessment

F2 was compared with a marketed herbal hair-wash powder. The report records a production cost of approximately INR 85 per 100 g for F2 and INR 150–200 per 100 g for the comparator.

The comparator's product name, manufacturer, batch number, purchase date, package size, and exact costing method were not supplied. The cost comparison should therefore be considered preliminary until these details are documented.

2.13 Statistical analysis

The report states that results were expressed as mean $\pm$ SD and that measurements were performed in triplicate for selected tests.

However, it does not identify a complete statistical plan, sample-size rationale, inferential tests, software, or treatment of missing data. These details should be added according to the analyses actually performed. Statistical significance must not be claimed without the underlying data and appropriate analysis.

3. RESULTS

3.1 Organoleptic characteristics

The organoleptic characteristics reported for F1, F2, F3, and the marketed comparator are presented in Table 2.

Table 2: Organoleptic characteristics of the formulations.

Parameter	F1	F2	F3	Marketed product
Colour	Greenish-brown	Light brown	Dark greenish	Brown
Odour	Characteristic herbal	Mild herbal	Strong herbal	Herbal
Texture	Fine powder	Fine powder	Fine powder	Fine powder
Appearance	Homogeneous	Homogeneous	Homogeneous	Homogeneous
Feel	Smooth, non-gritty	Smooth	Slightly gritty	Smooth

Based on the reported observations, all three trial formulations were described as homogeneous powders. F2 was reported to have a light-brown colour, mild herbal odour, fine texture, and smooth feel.

These are descriptive observations and should not be interpreted as evidence of clinical efficacy or safety.

3.2 pH

The reported pH values of the formulations and marketed comparator are shown in Table 3.

Table 3: pH values of the formulations.

Sample	Reported pH (mean $\pm$ SD)
F1	5.2 ± 0.08
F2	5.5 ± 0.12
F3	5.51 ± 0.09
Marketed product	5.8 ± 0.15

The reported pH values were mildly acidic, with F2 showing a pH of 5.5 ± 0.12 . This result describes the aqueous dispersion tested and should not, by itself, be

interpreted as proof of scalp compatibility or absence of irritation.

3.3 Foam height and reported foam retention

The reported foam measurements are presented in Table 4.

Table 4: Foam generation and retention

Sample	Initial foam height (cm)	Foam after 5 min (cm)	Reported retention (%)
F1	7.2 ± 0.3	6.8 ± 0.3	94.4
F2	7.8 ± 0.4	7.4 ± 0.4	94.9
F3	8.1 ± 0.3	7.7 ± 0.3	95.1
Marketed product	7.5 ± 0.5	7.0 ± 0.4	93.3

F3 had the greatest initial foam height in the reported data, while F2 was described as having excellent dirt dispersion.

The foam-retention calculation must be verified because the equation printed in the original report is inconsistent with the reported percentages. The original measurements should be used to recalculate and confirm these values before publication.

3.4 Dirt dispersion

The reported dirt-dispersion grades are summarized in Table 5.

Table 5. Reported dirt-dispersion assessment.

Sample	Reported grade	Score	Interpretation in source
F1	Good	3/4	Effective cleansing
F2	Excellent	4/4	Very effective cleansing
F3	Good	3/4	Effective cleansing
Marketed product	Excellent	4/4	Very effective cleansing

F2 and the marketed comparator received the highest reported dirt-dispersion score. However, the source report contains inconsistencies concerning the use of ink versus mineral oil in this test. The experimental procedure and scoring criteria must be confirmed before these results can be considered reproducible.

3.5 Wetting time, patch-test and stability observations

The values presented in Table 6 were reported in the source document. The assignment of wetting-time values and the comparability of PDII values should be verified against the original experimental records.

Table 6: Selected reported evaluation parameters.

Parameter	F2	Marketed product	Notes
Wetting time (s)	38 ± 2	42 ± 3	Source table presents values without a clear column heading; verify mapping
PDII	0.12	0.18	Verify methods, ethics documentation, and comparability
Stability (60 days)	Stable	Stable	Operational definition and full data needed
Cost per 100 g (INR)	Approximately 85	150–200	Costing basis and comparator identity needed

The report states a PDII of 0.12 for F2 and describes one volunteer with mild transient redness that resolved within a few hours. The reported pH values for F2 during the stability study were 5.5 ± 0.12 at day 0, 5.4 ± 0.10 at day 30, and 5.3 ± 0.11 at day 60. Foam height reportedly decreased from 7.8 ± 0.4 cm to 7.5 ± 0.3 cm over the same period.

These data are reported as supplied and require confirmation from raw records. The manuscript should not conclude that the formulation is broadly safe for all users on the basis of this small reported test.

3.6 Comparison with the marketed product

The source report includes a comparison between the prepared formulations and a marketed herbal hair-wash powder. F2 received an excellent dirt-dispersion grade,

while its reported pH was 5.5 ± 0.12 compared with 5.8 ± 0.15 for the marketed comparator.

The available data are insufficient to establish that F2 is statistically superior to the marketed product. A meaningful comparison requires the identity of the comparator, complete experimental results, clearly defined test methods, and appropriate statistical analysis.

4. DISCUSSION

The formulation results reported in the source suggest that a dry blend of Shikakai, Reetha, Amla, Bhringraj, Neem, Fenugreek, and Hibiscus can be prepared as a homogeneous powder and that the three trial compositions yield mildly acidic aqueous dispersions. The pH values are close to the range commonly targeted by hair-care formulators, but pH alone cannot establish safety, efficacy, or suitability for every scalp type.

The reported foam measurements indicate that the formulations generated measurable foam under the stated test conditions. Foam height is a product-performance attribute, but it is not a direct measure of cleansing efficacy. It should be interpreted alongside standardized soil-removal, sebum-removal, and consumer-use testing. F2 received the highest dirt-dispersion grade in the source report and may warrant further optimization, although the test protocol requires clarification and objective quantification.

F2 was selected in the report as the preferred composition, comprising 35% Shikakai and 25% Reetha, with the remaining 40% distributed among five other botanical powders. Its selection is plausible as a formulation-development decision, but a robust optimization claim requires predefined criteria, replicated batches, complete results for all measured endpoints, and appropriate statistical comparisons. The available numerical data do not establish that F2 is statistically superior to F1, F3, or the comparator.

The report describes a low PDII and small changes in selected parameters during 60 days of storage. These observations are preliminary and need cautious interpretation. Human patch testing requires documented ethics oversight and transparent adverse-event reporting. Stability claims should be supported by microbial quality data, validated methods, replicate results, and longer-term studies appropriate to the intended packaging and market.

Important limitations include incomplete numerical results for several planned tests; ambiguity in the foam-retention equation and dirt-dispersion protocol; unclear wetting-time sample quantity; absent botanical voucher details; insufficient description of statistical analysis; and references that require independent bibliographic verification. These gaps should be resolved before the manuscript is submitted to a peer-reviewed journal.

5. CONCLUSION

The supplied report describes three polyherbal hair-wash powder formulations and identifies F2—35% Shikakai, 25% Reetha, 15% Amla, 10% Bhringraj, 10% Neem, 3% Fenugreek, and 2% Hibiscus—as the preferred trial composition.

Reported pH, foam, dirt-dispersion, patch-test, and short-term storage observations provide a preliminary basis for continued formulation research. However, the available information is not sufficient to establish clinical hair-growth benefits, definitive dermatological safety, antimicrobial efficacy, or a validated shelf life.

Complete raw-data reporting, method correction, ethical documentation, botanical authentication, microbiological testing, and independently verified references are necessary before journal submission.

6. REFERENCES

1. Phytochemical analysis and cleansing efficacy of *Acacia concinna* pods — Patil SR, Ghagane SC, and Shinde VH. *J Pharm Pharmacogn Res.*, 2020; 8(3): 220–231.
2. Evaluation of saponin content and surfactant activity of *Sapindus mukorossi* pericarp — Kumar A and Singh RK. *Int J Green Pharm.*, 2019; 13(4): 312–318.
3. Hair growth promoting effects of *Eclipta alba* extract on cultured human hair follicle dermal papilla cells Munkhbayar S et al. *Int J Mol Sci.*, 2021; 22(11): 5693.
4. *Emblica officinalis* in androgenetic alopecia: A systematic review of 5 α -reductase inhibition — Sharma P et al. *J Cosmet Dermatol*, 2022; 21(5): 2044–2052.
5. Formulation and evaluation of herbal hair wash powder using Ayurvedic ingredients — Gaikwad AR and Jadhav SL. *Asian J Pharm Clin Res.*, 2021; 14(9): 44–49.
6. Stability and antimicrobial evaluation of herbal hair powder containing Shikakai, Reetha, Hibiscus and Neem — Nair VN et al. *J Drug Deliv Ther.*, 2020; 10(3): 178–183.
7. Primary skin irritation study of herbal hair wash powder: A Draize patch test approach — Verma S and Tripathi A. *Indian J Pharm Sci.*, 2023; 85(2): 412–418.
8. Ethnobotanical survey of herbal hair care practices in rural Maharashtra — Bhattacharya S et al. *Ancient Sci Life*, 2019; 38(3): 105–112.
9. A comprehensive review on Reetha (*Sapindus mukorossi*): Medicinal and cosmetic applications — Singh MK and Bhatt D. *J Ayurveda Integr Med.*, 2021; 12(4): 648–658.
10. *Hibiscus rosa-sinensis* in hair care: Phytoconstituents and pharmacological activity — Patel K and Mehta H. *J Ethnopharmacol*, 2022; 284: 114723.
11. *Neem* (*Azadirachta indica*) in cosmetics: Antimicrobial properties and scalp health benefits — Chandra S et al. *Fitoterapia*, 2020; 142: 104499.
12. Role of Bhringraj in hair fall prevention: A clinical and experimental perspective — Gupta R and Yadav AK. *J Cosmet Sci.*, 2021; 72(3): 201–212.
13. Fenugreek (*Trigonella foenum-graecum*) seed mucilage for hair conditioning: Extraction and characterization — Mishra P et al. *Int J Biol Macromol*, 2023; 235: 123756. *Indian Pharmacopoeia* 2022. *Indian Pharmacopoeia Commission*. Ghaziabad: IPC, 2022.
14. Guidelines for Stability Testing of Cosmetic Products. World Health Organization. Geneva: WHO, 2021.
15. ICH Q1A(R2) Stability Testing of New Drug Substances and Products. International Council for Harmonisation. Geneva: ICH, 2003.
16. OECD Guideline 404 Acute Dermal Irritation/Corrosion. Organisation for Economic Co-operation and Development. Paris: OECD, 2019.
17. Pharmacognosy — Kokate CK, Purohit AP, and Gokhale SB. Pune: Nirali Prakashan, 2022.
18. Pharmacognosy — Trease GE and Evans WC. Edinburgh: Saunders Elsevier, 2009.
19. Revisiting *Terminalia arjuna* – An ancient cardiovascular drug — Dwivedi S and Chopra D. *J Trad Complement Med.*, 2014; 4(4): 224–231.