

Research Article

Preparation and Evaluation of Cleansing and Nourishing Shampoo

Subhasri Mohapatra*, Ayush Kaushik

Department of Pharmaceutics, Royal College of Pharmacy, Raipur, India

Abstract

The main objective of this study is to evaluate and formulate a herbal shampoo formulation. Shampoo is one of the products used in daily life. Synthetic preservatives and detergents have sometimes been the cause of adverse effects among consumers. A more medical approach in reducing and replacing the synthetic ingredients is by incorporating natural ingredients whose functionality is comparable with their synthetic ingredients. The ingredients used in the herbal shampoo are 4% Reetha powder, 5% Shikakai powder, Aloe vera, Amla, 10% 4% Rose oil, 20% gelatin, 1% Lemon juice. A mixture was then prepared by mixing with heating each other and evaluated for its organoleptic and physico-chemical characteristics and performance tests in terms of pH, surface tension, foam stability and viscosity tests. The combination of several such ingredients of herbal origin has made it possible to design a highly effective shampoo formulation at laboratory scale and evaluated for some number of parameters e.g pH, surface tension, foam stability and viscosity to ensure its stable safety and efficacy. The formulated proportions of herbal ingredients of shampoo were clear brown colour with demonstrated good foam stability, detergency, cleansing property. The physico-chemical evaluation of the formulated shampoo showed ideal results. However, it sustained improved quality, product performance, and safety.

Keywords

Herbal Cleansing Shampoo, Herbal Nourishing Shampoo, Herbal Shampoo, The Cleansing and Nourishing Shampoo

1. Introduction

It is a hair care beautifying viscous product which is used to clean up the scalp and hair. Shampoo is a separated product applying to wet hair, roots and scalp, then rinsing it out. India: The word "shampoo" is derived from the Hindi word "chāmpo," which means "to press or massage" [1]. In ancient India, people used a shampoo and oils to clean their hair. Egypt: In ancient Egypt, people used a mixture of a natural mineral salt to clean their hair [2]. Greece and Rome: In ancient Greece and Rome, people used olive oil to clean their hair [3]. [Ancient Civilizations (2500 BCE - 500 CE)] people

in Europe used a mixture of soap, water, and herbs to clean their hair [4]. [Modern Era (1500 - 1900 CE)] In the 16th century, Europeans began using a mixture of soap, water, and perfumes to clean their hair. This shampoo was gentler than the previous one and became more popular among the upper class. India: In the 18th century, Indian barbers began using a mixture of herbs, oils, and water to clean their hair. Shampoo was known as "chāmpo" and became popular in Europe and other parts of the world [5]. 20th Century (1900 - 2000 CE) explored Synthetic Shampoos: In the 20th century, synthetic

*Corresponding author: subhasrimohapatra961@gmail.com (Subhasri Mohapatra)

Received: 11 September 2025; Accepted: 13 October 2025; Published: 26 November 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

shampoos were introduced. These shampoos were made from unpleasant chemicals and were often damaging to the hair [6]. Mild Shampoos: In the mid-20th century, mild shampoos were introduced. These shampoos were made from mild ingredients and were less destructive to the hair [7]. *Preparation and evaluation of cleansing and nourishing of shampoo 21st Century 2000 CE presented* Natural and Organic Shampoos. In the 21st century, natural shampoos have become popular. These shampoos are made from natural ingredients and are kind on the hair and the environment [8].

1.1. Ideal Characteristics of Modern Shampoo [9]

- 1) Cleansing Power: Effective removal of dirt and pureness from the hair and scalp.
- 2) Mildness: Mild are non-irritating to the hair, scalp, and eyes.
- 3) Foaming: Rich, creamy foam that helps to remove dirt and impurities to the hair.
- 4) pH Balanced: pH level that of the hair and scalp to prevent irritation and damage to the hair.
- 5) Moisturizer: Helps to fastening in moisture and reduce dryness and frizz to the scalp and hair.
- 6) Antidandruff: Helps to control attack of the dandruff and comfort an itchy scalp and hair.
- 7) Color Protect: Helps to assist color-treated of the hair from fading and harm to the hair.
- 8) Environmental Property: Made with environmentally genial ingredients and packaging.
- 9) Hypoallergenic: Less likely to cause allergic reactions and irritation to the hair.
- 10) Stability: Remains effective and stable over time, without separating or losing its stexture of the shampoo.

1.2. Exipient Used [10]

Thickeners: - Carbomer, a synthetic polymer that helps to thick and stabilise the shampoo. Foaming agents e.g Sodium lauryl sulfate (SLS a synthetic surfactant that helps to make a rich lather of the shampoo. Moisturizers a natural humectant that helps to moisturise the hair and scalp. A synthetic moisturizer that helps to fixing in moisture and reduce dryness and frizzy hair. The pH adjusting agents, natural virulent that helps to adjust the pH of the shampoo. A synthetic base born that helps to adjust the pH of the shampoo. Preservatives a synthetic preservative that helps to prevent the growth of microorganisms to the hair. Antidandruff agents helps to control attack of the dandruff and comfort an itchy scalp and hair. A synthetic agent that helps to control attack and relieve an itchy scalp and hair.

1.3. Type of Shampoos

- 1) Aloe Vera Shampoo: Console and smooth the scalp,

reducing irritation and inflammation of the hair.

- 2) Neem Shampoo: Known for its antifungal and antibacterial properties, help to control dandruff and other scalp infections to the hair.
- 3) Tea Tree Oil Shampoo: Helps to control dandruff, itching, and daftness, while also promoting healthy hair growth to scalp.
- 4) Rosemary Essential Oil Shampoo: Improves spread to the scalp, promoting healthy hair growth and reducing dandruff to the hair.
- 5) Saw Palmetto Shampoo: Helps to block the transition of testosterone to dihydrotestosterone (DHT), progression healthy hair growth.
- 6) Ginkgo Biloba Shampoo: Improves blood flow rate to the hair, promoting healthy hair growth and reducing dandruff of the hair.
- 7) Brahmi Shampoo: Known for its antioxidant and anti-inflammatory properties, helping to promote increasing hair growth and reduce infection.
- 8) Tulsi Shampoo: Helps to pure and improve the hair growth, promoting healthy hair growth and reducing dandruff of the scalp [11].

1.4. The Aim of Formulating Herbal Shampoo

- 1) to provide a natural and effective way to clean and care for the hairand scalp, while promoting healthy hair growth and reducing the risk of scalp problems [12].
- 2) To clean and pure the hair and scalp: Using natural herbs and botanicals to remove dirt, oil, and other impurities from the hair and scalp.
- 3) To improved healthy hair growth: Using herbs and botanicals that stimulate hair growth, such as saw palmetto and biotin.
- 4) To reduce the risk of scalp problems: Using aromatic plant that have antifungal and antibacterial properties, such as tea tree oil and neem [13].
- 5) To moisturize and nourish the hair and scalp: Using herbs that hydrate and moisturize the hair and scalp, such as aloe vera and coconut oil.
- 6) To protect the hair and scalp from environment: Using botanicals that have antioxidant properties, such as green tea and rosemary.
- 7) To improve the appearance and texture of the hair: Using rosemary that improve the shine, softness, and manageability of the hair [14].
- 8) To provide a natural and gentle alternative to conventional shampoos: Using herbs and botanicals that are gentle and non-irritating, making it suitable for sensitive scalps and hair [15].

The main objective of this study is to formulate and evaluate herbal shampoo in terms of pH, surface tension, foam stability and viscosity. The combination of several ingredient of herbal origin has made it possible to secure highly effective shampoo. The formulation at laboratory scale was done and

evaluated for number of parameters to ensure its safety and efficacy.

2. Material & Method

2.1. Material

2.1.1. Herbal Extracts

Aloe Vera is soothing and moisturizing properties for the scalp and hair. It helps to reduce dandruff and promotes hair growth [16]. *Shikakai* (*Acacia concinna*) acts as a natural cleanser, helps maintain the pH of the hair, and is often used for cleaning hair [17]. *Reetha* (*Sapindus mukorossi*) Soapnut is a natural surfactant used to cleans the hair and is gentle in the hair and scalp. *Amla* (*Phyllanthus emblica*) is used to nourishing and conditioning to the hair, and promoting healthy growth and reducing dandruff to the hair [18].

2.1.2. Preservatives

Phenoxyethanol, *Ethylhexylglycerin*, or *Glycol* are used to prevent microbial contamination and to extend the shelf-life of the shampoo. *Rose Oil*: It's moisturizing properties help nourish and conditioning hair, promoting healthy growth of hair and reducing dandruff [19]. *Base Solvent* e.g. Gelatin:

Gelatin is used in hair care products, such as shampoos and conditioners, to improve the quality of hair and scalp [20].

2.2. Methods

2.2.1. Preparation of Extract

About 100 g of each plant materials extract, namely *Acacia concinna*, *Sapindus mukorossi*, *Emblica-officinalis*, were homogenized. The material was extracted by extraction method. The extract of each plant material was separated and evaporated.

2.2.2. Formulation of Herbal Shampoo

Formulation of the herbal shampoo was done as per the formula given in Table 1. To the gelatin solution (20%), added the herbal extract and mixed by shaking continuously at the time interval of 20 min. 1 ml of lemon juice was also added with constant stirring. To improve formulation, sufficient quantity of essential oil (rose oil) was added and made up the volume to 50 ml with gelatin [21]. List of formulation ingredients with its percentage use and purpose is shown below in Table 1. Formulation ingredient and their quantity are given in Table 2. Name of the herbs used in this study and its use are shown in Table 3.

Table 1. formulation of herbal shampoo 50 ml.

Formulation ingredient	Percentage	Use	Purpose
Amla Extract	5%	Hair and scalp nourishment	Natural surfactant, cleanses and purifies hair and scalp
Shikakai	5%	pH balancing and fragrance	Balances scalp pH, adds pleasant fragrance
Aloe Vera	5%	Hair and scalp moisturizing	Soothes and calms scalp, reduces irritation and inflammation
Rose oil	4%	pH balancing and fragrance	Balances scalp pH, adds pleasant fragrance
Reetha	10%	Hair and scalp cleansing	Natural surfactant, cleanses and purifies hair and scalp
Gelatin	20%	Conditioner	Hydrates and moisturizes hair and scalp
Lemon juice	1%	Lustrous (For shining)	To cleans scalp and hair

2.2.3. Evaluation of Herbal Shampoo

The prepared formulation was evaluated for product performance which includes organoleptic characters, pH, physicochemical characterization, and for solid content. To guarantee the nature of the items, particular tests were performed for surface tension, foam volume, foam stability, and wetting time using standard protocol [22].

(i). Visual Assessment

The prepared formulation was assessed for color, clarity, odor, and froth content.

(ii). pH Determination

The pH of the prepared herbal shampoo in distilled water (10% v/v) was evaluated by means of pH analyzer at room temperature [23].

(iii). Surface Tension Measurement

The prepared shampoo in distilled water (10% w/v) was evaluated for surface tension using stalagmometer formal routine drop weight method at room temperature and results were mentioned. [24].

(iv). Foam Stability Test

The stability of the foam was determined using cylinder shake method. About 50 ml of formulated shampoo (1%) solution was taken in a graduated cylinder of 250 ml capacity and shaken for 10 times vigorously. Foam stability was measured by recording the foam volume of shake test after 1 min and 4 min, respectively [25]. The total foam volume was measured after 1 min of shaking.

Table 2. Formulation Ingredients their quantities used (50 ml).

Ingredient	Quantity (50 ml)	Percentage
Amla Extract	2.5 g	5%
Shikakai	2.5 g	5%
Aloe Vera	2.5 g	5%
Rose oil	2.3 g	4%
Reetha	5 g	10%
Gelatin	10 g	20%
Lemon juice	0.5 g	1%

Table 3. Herbs used in the preparation of shampoo and their uses.

Sr. No.	Name of the Herb	Uses
1.	Shikakai is the fruits of the plant <i>Acacia concinna</i> , belonging to the family Leguminosae	Promotes hair development, controls hair fall, battles dandruff,
2.	Aloe vera is the juice collected by incision, from the bases of the leaves of various species of aloe, belonging to the family Asphodelaceae.	Used in herbal shampoo, also reduce inflammation, which can help people with dandruff
3.	Reetha consists of fruits of the plant <i>Sapindus mukorossi</i> , belonging to the family Sapindaceae	Shows cooling effect and excellent cleansing effect on the skin, prevent the scalp from drying
4.	Amla is of fruits of the plant <i>Embolica-officinalis</i> , belonging to the family Phyllanthaceae	Strengthen the scalp and hair, stimulate hair growth, reduce hair loss,

3. Result and Discussion

3.1. Preparation of Plant Extract

All the herbs were accurately weighed by using digital balance. The crude herbs were collected and these individual ingredients were using for boiling till water gets reduced to one quarter. After boiling, the extract was cooled at normal room temperature and then filtered with muslin cloth to get the final filtrate [30]. Amla, shikakai, reetha and all other extract is shown in Figures 1, 2, 3 respectively.



Figure 1. Amla Extract Preparation.



Figure 2. Shikakai Extract Preparation.



Figure 3. Ingredient Extract of Amla, Shikakai, Reetha Preparation.

3.2. Preparation of Herbal Shampoo

Shikakai, Reetha, Amla, were taken in a bowl and added and mixed well. Later Aloe vera was added then added rose oil all mixed components mixture were heated for 15-20 mins on a hot plate. The mixture was added to gelatin as a base. Cooled mixture was finally added to lemon juice. Then the herbal shampoo preparation is completed.

All prepared extract ingredients pictures are shown in Figure 4. Testing of extraction images is given in Figure 5.



Figure 4. All prepared Extract Ingredient.



Figure 5. Testing of Extraction.

3.3. Evaluation Parameters of Herbal Shampoo

3.3.1. Physical Appearance [26]

The attractiveness of shampoos for consumers tends to be judged visually to observe clarity, colour, odour it shows physical appearance of the formulation. Physical appearance of the produced shampoo is found as clear, brown in colour, aromatic odour and Smooth appearance (Table 4).

3.3.2. pH [27]

The pH levels of the shampoo tested in 1% and 10% solutions were evaluated using a pH meter at a room temperature of 25 ± 2 °C. The final product was measured in range 6.13 ± 6.76 . Result of image is shown in Table 4.

3.3.3. Foaming Ability and Foaming Stability [28]

The cylinder shake method is the most widely used method for determining foaming ability. At room temperature, 50 ml of the shampoo solution was filled into a 250 ml graduated cylinder, which was then covered by hand and shaken ten times. The total volume of the foam content after 60 sec of shaking was recorded. The height of the foam generated was measured immediately. To evaluate foam stability, the same procedure was performed and the foam volume after 20 min was measured.

3.3.4. Measurement of Surface Tension [29]

In this method, stalagmometer is used by drop weight method. Surface tension measures the strength of the cohesive forces of liquids. For example, water has strong cohesive forces, so surface tension is more (Table 4). Surface tension is determined for the cleansing and nourishing shampoo as 35-40 dynes/cm which is less than water 72 dynes/cm.

3.3.5. Skin Irritation Test [30]

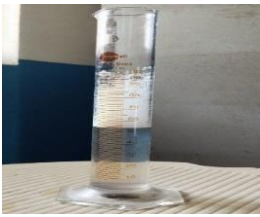
Prepared polyherbal cleansing and nourishing shampoo was applied on skin for 5 minutes after washed and test for irritation or inflammation on the skin (Table 4).

3.3.6. Washability [31, 32]

Wash your hands after applying of shampoo on the hand. (Table 4).

3.3.7. Stability Studies [33]

Table 4. Evaluation tests for formulated shampoo.

Sr.no.	Evaluation test	Result	Image
1.	Physical appearance is clear, Brown in colour, Aromatic odour, Smooth appearance		
2.	pH	6.13±6.76	
3.	Foaming ability and foaming stability	15 ml and stable for more than 5 mins	
4.	Skin Irritation Test	Non- irritant	
5.	Washability	Easily Washable with water	

The stability studies for the herbal formulations were performed according to ICH guidelines. The formulations were tested for 6 months without any change in its evaluation results, which can be an ultimate proof of absence of micro

organisms. Physical appearance, surface tension, foam stability and pH determination performed during 6 months. Stii product remained unchanged. The evaluation test results with images for formulated shampoo are given in Table 4.

4. Conclusion

The herbal shampoos are the preparations which are used for the washing and cleaning of hairs and to provide nourishment. The herbal shampoos are widely used due to their no or less side effects as compared to conventional shampoos, because it contains pure natural or herbal ingredients rather than synthetic chemicals. Herbal shampoo does not require animal testing and it is earth and skin friendly. The herbal liquid shampoo was formulated by using the various herbal ingredients with 5% of Amla, Shikakai, Aloevera, 4% roseoil, 10% Reetha, Gelatin 20%, and lemon juice 1%. From the overall results showed neutral pH, nonirritant to the skin. Foam stability 5 mints, Surface tension is between 35-40 dynes /cm. Evaluation studies showed good results of appearance, wash ability, non-irritant to the skin, foam stability, dirt dispersion activity as on skin spread well without giving feeling presence of any gritty particles, anti-microbial activity as shown null reaction skin after application, Rheological/surface tension tests. The formulation of a cleansing and nourishing shampoo requires attention to detail in ingredient selection, formulation, and testing. A good shampoo should balance effective cleansing with gentle nourishment, leaving the hair feeling clean, soft, and healthy after each wash. Regular evaluation ensures that the product maintains its effectiveness and safety throughout its stability period of 3 weeks. Though the designed product is neutral in nature, and is dark brown in colour product will be compatible with the glass and plastic bottle as a container of packaging with beautiful design.

5. Future Scope

In present scenario industries and researchers are trying to formulate having a better performing shampoo to challenge consumer expectation with emphasis on safety, efficacy along with reasonable cost preferably using herbal ingredients which brings such formulations being demanding every day in era. We tried our level best to formulate a herbal nourishing shampoo to avoid any conflict of interest and declare any personal or professional interest to any patient who may be affected. We are thankful to the Herb dealer in Raipur to provide us all crude products used in the work. In vivo test must be performed. Change in concentration of all herbal ingredients may enhance the efficiency with low cost designed product. Today's world has number of cosmetics products still people take interest to change their usually usable cosmetic product according to many factors like skin type, cost expenses, region, age, life style, living style and many more. So countless products has enhanced demands for formulation.

Abbreviations

DHT Dihydrotestosterone

Author Contributions

I Aysh kaushik and Dr Subhasri Mohapatra are thankful to Royal college of Pharmacy, Raipur, C. G., for giving us the party line, during, co-operation and co-ordination during tenure of our work. We are sending our heartfelt and sincere thanks to our Chairman Mr Toshan Chandrakar, Secretary Mr Kamal Chandrakar, Principal Dr. Deepak Kumar dash, for providing ever-encouragement to perform research projects. I Ayush kaushik is grateful to Dr. Subhasri Mohapatra for all support to get plan of action to step into my research work.

Conflicts of Interest

Authors have declared that no conflicts of interest exists.

References

- [1] Scurlock, JoAnn (2014). Sourcebook for Ancient Mesopotamian Medicine. Society of Biblical Literature. pp. 429-430, <https://doi.org/10.2307/j.ctt1287mwm>
- [2] Sonawane Sneha K, Shinde Prajakta P. (2021) Shampoo-Hair care cosmetics Journal of Cosmetic Science, 12(2): 102-6, <https://doi.org/10.52711/2321-5844.2021.00014>
- [3] Breasted, J. H. (1906). A History of Egypt. Charles Scribner's Sons, <https://doi.org/10.1017/CBO9781316178423s>
- [4] Riches, D. (2015). The History of Shampoo. The British Journal of Dermatology, 173(3), 531-536. <https://doi.org/10.2174/1389201016666150817094447>
- [5] Corson, R. (1972). Fashions in Hair: The First Five Thousand Years. Peter Owen. 1980.
- [6] Vigarello, G. (1988). Concepts of dCleanliness: Changing Attitudes in France Since the Middle Ages., Cambridge University Press, identifier ark: ark:/13960/s2xhd5f79.
- [7] Singh, R. (2017). History of Shampoo. Journal of Cosmetic Science, 68(3), 239-246. <https://doi.org/10.1111/ics.12448>
- [8] Breuer, M. M. (1985). The History of Shampoo. Journal of the Society of Cosmetic Chemists, 36(2), 71-83.
- [9] Fox, C. (1988). The Development of Mild Shampoos. Journal of the Society of Cosmetic Chemists, 39(2), 61-71. <https://doi.org/10.1111/j.1468-2494.1988.tb01449.x>
- [10] Chaudhary, S. (2017). Natural and Organic Shampoos: A Review. Journal of Cosmetic Science, 68(3), 247-254.
- [11] Schwartz, J. R. (2015). The Science of Shampoo. Journal of Cosmetic Science, 66(3), 179-188. <https://doi.org/10.1111/ics.12255>
- [12] Gavazzoni, Dias. (2014). pH of Shampoos: A Review. Journal of Cosmetic Dermatology, 16(2), 148-153. <https://doi.org/10.1111/jocd.12146>

- [13] M. R. Miller, M. R. Moore. (2018). A Review Surfactant shampoo technology. *Journal of Cosmetic Science*, 6(3), 251-258.
- [14] Maria Farnanda Reis Gavazzoni, Dais. (2014). pH of Shampoos: A Review. *Journal of Cosmetic Dermatology*, 16(2), 95-9, <https://doi.org/10.4103/0974-7753.139078>
- [15] Chaudhary S. (2017). Aloe Vera: A Review of Its Medicinal Properties and Uses. *Journal of Cosmetic Science*, 68(3), 259-266. <https://doi.org/10.1111/jcos.12351>
- [16] Utane R, Deo S, Itankar P March (2017). Preparation of Herbal Shampoo (HS) by green method and their characterization, *International Journal of Researchers in social science and information studies* ISSN 2347-8268, Vol: V, 254-258.
- [17] P Naga Padma, K Anuradha, K Divya, Comparison of potency of antifungal action of dandruff shampoos and different plant extracts, 2015, Page Number: 327 to 331, Volume 4, Issue: 2, <https://doi.org/10.5958/2319-5886.2015.00061.2>
- [18] Nikita R., Nikam, Priyanka R. Patil, Rahul P Yadav, Rohan R. Vakharia, Dr. C. S. Magdum. (2018). Formulation and Evaluation of Herbal Shampoos: A Comparative study Research. *Journal of Topical and Cosmetic Science*, Volume: 10, Issue: 2, Year: 2019, <https://doi.org/10.5958/2321-5844.2019.00013X>
- [19] Amar Surjus, Resham Vasanie, D. G Saple, (2012). Aloe vera: A short review. *Indian journal of Dermatology*, 53(4), 163 <https://doi.org/10.4103/0019-5154.44785>
- [20] P. S. Raj, N. Murugan, & S. P. Meena (2011). *Acacia concinna*: A review for its phytochemistry, Ethnomedicinal uses and medicinal potentials with respect to molecular mechanisms. *International Journal of Pharmaceutical science and research*, 7(3), pg 350-357. <https://doi.org/10.13040/IJPSR.0975-8232>
- [21] Variya BC, Bakarania AK, Patel SS, *Pharmacol Res Sept* (2016). *Embellica Officinalis (Amla)*: A review of its phytochemistry, ethnomedicinal uses and medicinal potential with respect to molecular mechanisms, <https://doi.org/10.1016/i.phrs.2016.06.013>
- [22] Kumar, N., et al. (2019). Rose oil promotes hair growth by increasing hair follicle density and reducing dandruff. *Journal of Cosmetics, Dermatological Sciences and Applications*, 9(2), 147-154. <https://doi.org/10.18376/jcdsa/2019/9.1/53>
- [23] Abdul Kader Mohiuddin, Bhari D, Quazi A, Joshi A. Formulation and evaluation of anti-dandruff shampoo. *International Journal of Engineering Science and Computing*. 2020; 10(3): 25116-25122.
- [24] PSS Prasanna Kumar, N Priyanka, M Ganesh Subrahmanyam, K AkshayKumar, A Eswar Venkat, V Sangeetha, K Manjari, D Pavani and D Sirishatation and Formulation and evaluation of herbal shampoo. *Journal of Pharmacognosy and Phytochemistry*. 2020; 8(9): 2860-2869. <https://doi.org/10.22271/phyto.2024.v13.i2b.14897>
- [25] Rashmi S Pal, Nikita Saraswat, Wal Pranay, Yogendra Pal., Preparation and assessment of polyherbal antidandruff formulation, *Open Dermatol journal*. 2020; Volume-14: pg: 22-27, <https://doi.org/10.2174/1874372202014010022>
- [26] Sravanthi K, Kavitha N, Soumy K. A review on formulation and evaluation of herbal anti-dandruff shampoo. *International Journal of Pharmaceutical research and Application*. May-June 2021; 6(3).
- [27] Mahmoud Bahmani, Hedayatollah Shirzad, A review paper on ethanobotanical and therapeutic uses of fenugreek (*Trigonella Foenum-graceum*-L Sage Journal, *Journal of Evidence Based Integrative Medecine* April 27 2015; 1(1), pg: 53-69. <https://doi.org/10.1177/2156587215583405>
- [28] Sonali S Gadge, Sakshi P Wankhade, Sakshi Tapare, Sakshi M Kalaskar and Sakshi D Holey. Formulation and evaluation of polyherbal antidandruff shampoo. *J Pharmacogn Phytochem* 2023; 12(4): 35-41. <https://doi.org/10.22271/phyto.2023.v12.i4a.14691>
- [29] More, A. G., Pote, P. D., Kore, P. S., & Garhwani, Y. D. (2022). Formulation and Evaluation of Polyherbal Anti-Dandruff Shampoo. *International Journal of Ayurvedic Medicine*, 13(2), 365-369. <https://doi.org/10.47552/ijam.v13i2.2696>
- [30] Bassett IB, Pannowitz DL, Barnetson RS. A comparative study of tea-tree oil versus benzoylperoxide in the treatment of acne. *Med J Aust*. 1990; 153(21): 8. <https://doi.org/10.5694/j.1326-5377.1990.tb126150.x>
- [31] A Review Paper -Formulation and Evaluation of Herbal Shampoo Arya Gupta, Priya Tiwari, Ruchi Verma Astha Gupta *International Journal of Pharmaceutical Research and Applications* 10(4) July-Aug 2025, pp: 706-715 <https://doi.org/10.35629/4494-1004706715>
- [32] L. R. Lang, M. A. Guzmán, & C. A. S. Romero (2018). Natural preservatives in personal care products: An overview. *Journal of Cosmetic Science*, 69(3), 139-144. <https://doi.org/10.1111/jcs.12450>
- [33] J. A. Barel, M. Paye, & H. Maibach (2009). *Handbook of Cosmetic science & Technology* (3rd ed.).