Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 19s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Comprehensive Review on Formulation and Evaluation of Herbal Shampoo

Venkatesan Natarajan[1], Dharshini Jaishankar[1], Lohitha Sugumar[1], Nisha Suresh[1], Reka Thiruvengadam[1]

[1]School of Pharmacy, Sri Balaji Vidyapeeth (Deemed to Be University), Pondicherry, India- 607402.

Corresponding Author:

Email ID: venkatesann@sbvu.ac.in

Cite this paper as: Venkatesan Natarajan, Dharshini Jaishankar, Lohitha Sugumar, Nisha Suresh, Reka Thiruvengadam, (2025) Comprehensive Review on Formulation and Evaluation of Herbal Shampoo. *Journal of Neonatal Surgery*, 14 (19s), 704-712.

ABSTRACT

Shampoos are the primary hair care items. Herbal shampoo is cosmetic products that use herbs to cleanse the hair and scalp. This pertains to the efficacy and safety of herbal shampoos as alternatives to conventional hair care products. Due to apprehensions over the unwanted effects of synthetic ingredients, herbal shampoos have surged in popularity owing to their natural composition and prospective health advantages for hair and scalp. This article discusses various types of herbal shampoos, their compositions, and essential components, while also highlighting the manufacturing and assessment processes. The study emphasizes the importance of quality control, safety, and efficacy in the formulation process. The goal is to highlight the growing popularity of herbal hair care and encourage better hair care habits.

Keywords: *Herbal shampoo formulation, Herbal extracts for hair care, Conditioning agents, Preservatives in herbal cosmetics*

1. INTRODUCTION

Human hair is an essential component. It is a fundamental aspect of human attractiveness. Sebum generation, apocrine sweat, pheromones production, thermoregulation, and protection from environmental aggressors are just a few of the many roles that human hair plays (Road,2024). Hair care products which comes under cosmetic; A cosmetic is a product used to cleanse, beautify, increase attractiveness, or change one's look. It derives from the Greek term "Kosmeticos," which refers to the preparation employed for this purpose and applied to the human body or any portion of it. The hair care products are daily tools used to clean the scalp and hair, often used as beautifying agents which are designed to remove dirt, oil, and dandruff from hair and scalp, providing nourishment and a healthy appearance. The technology for cleaning hair and scalp was developed in the 19th century with the introduction of cake soap and subsequent production of shampoo products. Shampoo, originating from the Indian subcontinent, originated in 1762 and is derived from Hindi" champoo", meaning head massage with hair oil. Shampoo is a liquid or cream formulation of soap or detergent utilised for cleansing hair. It is a hair care product, usually a thick liquid, designed to eliminate undesirable residue from hair without excessively removing sebum, making washing the predominant method of hair treatment (Thakur *et al*., 2020).Modern shampoo, introduced in the 1930s, was the first synthetic shampoo, initially used for laundry and carpet cleaning, and later evolved into hair shampoo.(B Pharm & Hoque, 2021) Pollution has led to hair damage, causing spilt ends, roughness, retarded growth, loss of shine, and hair falls. Shampoos are used to address these issues, but synthetic shampoos, made from chemical constituents, can cause side effects. On the other hand, herbal shampoos use natural ingredients as cleaners, resulting in a good effect without any side effects. Natural ingredients are useful due to their pure qualities.(Bhavani *et al*., 2023) . Synthetic shampoos contain surfactants for cleansing and foaming, but their continuous use can cause eye and scalp irritation, hair loss, and dryness, making herbal formulations an alternative to synthetic shampoos. Herbal shampoos are cosmetic preparations using traditional ayurvedic herbs to cleanse hair and scalp, effectively removing oils, dandruff, dirt, and environmental pollutions, similar to regular shampoos . (Maurya *et al*., 2021)

HISTORY

Since ancient times, many herbs and extracts have been employed in shampoos throughout the Indian subcontinent. Sapindus, known as soapberries or soapnuts, was employed to create an efficient shampoo by boiling it with dehydrated Indian gooseberry. The concentrated extract may be produced utilising amla and several other botanicals. Ancient Indian texts reference the saponins in the apple pulp as a surfactant. The foam generated by soapberry extract is referred to as phenaka, resulting in hair that is smooth, shiny, and manageable. Additional hair-cleansing components are shikkai, hibiscus flowers, ritha, and arappu. Guru Nanak, the progenitor of Sikhism, alluded to soap and the soapberry tree in the sixteenth century. (Vinchu *et al*., 2022)

Hair fibres, ranging in diameter from 50 to 100 µm, serve both protective and cosmetic purposes. They protect the scalp from UV damage, aid in thermoregulation, and facilitate social contact. Human hair consists of elongated, pigmented terminal hair fibres, whereas the body has unpigmented vellus hairs spanning 2-4 cm in length. Hair fibres comprise the cuticle, cortex, and medulla, which are also components of the hair follicle.

Cuticle

The cuticle serves as a protective layer safeguarding the underlying cortex from external environmental harm. It comprises 6-10 layers of overlapping scales, with approximately one-sixth of each surface visible. Adjacent hairs grow and move outwards, facilitating easy removal of dirt and scales. The cuticle cells' shape and orientation limit friction between hair Fibers. The outermost layer is the epicuticle, a lipid layer with 18-methyl eicosanoic acid and free lipids. The A-layer, with 30% cystine content, provides structural strength and rigidity. The B-layer, or the exocuticle, has 15% cystine content . The endocuticle, consisting of proteins with less cystine concentration, exhibits greater swelling in water and possesses enhanced mechanical softness. The cellular membrane complex (CMC) serves as the intercellular adhesive that binds the cuticle cells, predominantly consisting of non-keratinous protein with little cystine content. The CMC consists of the δ-layer surrounded by two lipid-rich β-layers.

Cortex

The cortex, the principal component of hair mass, consists of cortical cells and the cell membrane complex (CMC). These elongated cells include melanosomes that contain eumelanin (brown/black pigment) and/or pheomelanin (red pigment), which are responsible for hair colouration. The cortex is heavily structured and contains macrofibrils aligned parallel and longitudinally to the axis of the hair fibre. Each macrofibril is structured helically and comprises intermediate filament proteins (IFPs) and keratin-associated proteins (KAPs). The matrix is composed of crystalline proteins with elevated cystine levels, whereas intermediate filaments, characterised by low cysteine content, consist of sub filamentous units, protofilaments, and brief lengths of α-helical polypeptide chains organised in a coiled coil configuration. The cortex is responsible for considerable hair tensile strength. Three types of cortical cells have been recognised in the hair fibre: orthocortical, paracortical, and mesocortical cells.

Medulla

Fine hair fibres comprise cuticle and cortex, with the medulla located at the centre. It comprises spherical hollow vacuoles, loosely arranged along the fibre, interconnected by a CMC-type structure. These cells constitute a little fraction of the keratin fibre bulk. The medulla may be continuous, discontinuous, or missing, and is thought to contribute minimally to the mechanical characteristics of hair fibres. (Jadhav *et al*., 2018)

Ideal properties of herbal shampoo

1. Excessive sebum, fatty substances, loose corneal cells, and dust must be meticulously eliminated from the hair.
2. To satisfy the user's psychological requirements, it must produce a enough amount of foam.
3. It should be easily removable when cleaned with water.
4. The outcome should be non-dry, silky, lustrous hair that is manageable and has reduced fly-away.
5. The hair should get a pleasant fragrance from it.
6. It should not induce irritation to the eyes or scalp.
7. The hands should remain smooth and unchapped as a consequence . (*Sakshi More*, 2024)

FUNCTION OF HERBAL SHAMPOO

1. Cleansing: Effectiveness on removing dirt, oil, and pollutants from the hair and scalp without stripping natural oils.

2. Nourishing: Natural ingredients in herbal shampoos, such as herbs and essential oils, provide essential nutrients that promote healthy hair growth and improve hair texture.

3. Moisturizing: Many herbal shampoos contain ingredients like aloe vera or coconut oil that help maintain moisture balance, preventing dryness.

4. Soothing: Herbal extracts like chamomile or tea tree oil help calm irritated scalps and reduce inflammation, itching, or flakiness.

5. Fortification: Components like neem, bhringraj, or hibiscus contribute to hair fortification, diminishing breakage and enhancing general hair vitality.

6. lustre and Lustre: Consistent application of herbal shampoos can augment the inherent lustre and vitality of hair,

rendering it more healthful in appearance.

7. Dandruff Control: Botanicals such as tea tree oil and neem include antifungal and antibacterial attributes that aid in diminishing dandruff and scalp accumulation.

8. Natural and Safe: Herbal shampoos are devoid of harsh chemicals, rendering them a safer alternative for sensitive scalps and hair types (Sharma ,Virk , 2023).

ADVANTAGES

- It has only organic and pure ingredients
- It has no negative side effects
- It excludes surfactants like SLS
- It must be skin-friendly
- There can be no animal testing.

TYPES OF SHAMPOO

Shampoos have advanced from basic cleaning agents to multipurpose formulas that address various hair types, scalp problems, and consumer preferences. The desire for customised hair care has resulted in the creation of diverse formulations, each designed with particular components and classified according to composition, functioning, and intended demographic. And those are mentioned below;

Conventional Shampoo, Medicinal Shampoo, Solid shampoo , Powder shampoo ,Cream shampoo ,Jelly shampoo ,Aerosol Shampoo, Clear Liquid shampoo, Gel Shampoo, Liquid Cream Shampoo ,Medicated Shampoo,Shampoo with conditioner (2 in 1 shampoo),Baby shampoo ,Sulphate free shampoo ,Dry shampoo ,Shampoo bars ,Colour protect shampoo,Everyday shampoo, Professional shampoo and Shampoos for different types of hair.

Conventional Shampoo

The predominant cosmetic product for hair care is shampoo. It is aptly characterised as a practical cosmetic formulation used to the hair and scalp to eliminate dirt, environmental contaminants, and residual hair style products (Prajwal *et al*., 2023).

Medicinal Shampoo

A diverse array of plants is utilised in shampoos, providing advantageous effects on hair due to their content of vitamins, amino acids, sugars, glycosides, phytohormones, bioflavonoids, fruit acids, and essential oils. Efficient techniques for intentionally contaminating hair, subsequently purifying it through various treatments, and assessing the remaining lipids on the hair by gas chromatography (Prajwal *et al*., 2023).

Solid Shampoo

Compared to traditional shampoos, solid shampoos have a few additional advantages. They are easier to carry and have a longer shelf life than liquid formulations because of their higher microbiological stability (Prajwal *et al*., 2023).

Powder Shampoo

This is a dry powder version of this shampoo. When water or other solvents are added to powdered shampoos, the components' activity is decreased, especially if medicinal shampoos are used . These shampoos are no longer in use since they are difficult to apply (Prajwal *et al*., 2023).

Cream Shampoo

A modified kind of clear liquid cream shampoo is referred to as lotion shampoo. Furthermore, solubilising agents like magnesium stearate are employed to dissolve the supplementary opacifier. These shampoos are packaged in a collapsable tube and possess a paste-like consistency. They are exceedingly beneficial in hair salons (Sonawane *et al*., 2021)

Jelly Shampoo

The texture of these is transparent and dense. usually by using a gelling ingredient (cellulose, for instance). It is widely used in beauty parlors and hair salons. Laundry soap can be used either by itself or in conjunction with the primary ingredient, detergent. The amount of detergent used can be changed to get the gel's required consistency. Additionally, gel shampoo is produced by thickening clear liquid shampoo with methyl cellulose(Sonawane *et al*., 2021).

Aerosol Shampoo

They are called aerosol shampoos because of the spray cylinders they come in. Their composition, processing, and packaging are intricate due to the use of an extra propellant. The supplementary propellant must be combined with the active ingredients

in the shampoo without diluting them. A valve is located in the container area. Shampoo is produced by pressing the valve. Consequently, it is sometimes referred to as foam type shampoo (Sonawane *et al.,* 2021).

Clear Liquid Shampoo

These are the most commonly used clear liquid preparations. Typically, low-cloud-point detergent is used to make them. These preparations can also make use of alkanol amides. It's possible that some of these shampoos are transparent (Prajwal *et al.,* 2023).

Gel Shampoo

These are often created by adding a gelling agent and are thick and translucent. Hair salons and beauty parlors make excellent use of it. The main component is detergent, which can be used either by itself or in conjunction with soap. A gel with the desired consistency can be produced by adjusting the detergent percentage. (Sonawane *et al.,* 2021)

Medicated Shampoo

These shampoos, including ones formulated for particular conditions such as seborrhoeic dermatitis and scalp psoriasis, include medicinal compounds that treat problems of the scalp or hair (George , Potlapati, 2021).

Shampoo with conditioning [2 in 1 Shampoo]

The term "two-in-one" shampoos refers to shampoos that have conditioning chemicals added to them. 2-in-1 cleaners frequently include amphoteric detergents (George , Potlapati, 2021).

Baby Shampoo

Baby shampoos are gentle cleansers that don't cause eye irritation. Typically, it comprises substances that are less irritating to the eyes and safe for the scalp and hair. Instead than nourishing the hair fiber, the majority of pediatric shampoos emphasize the "no tears" notion. Their pH is generally higher and more in line with the physiological pH of tears. Betaines and other amphoteric group detergents are used in these shampoos. Although the detergent doesn't sting, it can nevertheless harm the eyes if baby shampoo gets in them by accident. The damage isn't painful. Consequently, it is recommended that adults refrain from using paediatric shampoos for hair cleansing, particularly if their hair is color-treated (George , Potlapati, 2021).

Sulphate free shampoo

Shampoos without sulfates are cleaners that use less detergent surfactants instead of anionic ones. They concentrate more on the health of hair fibers and have a comparatively gentler washing effect.They don't require water to function. The product's alcohol or starch absorbs extra oil and grease from the hair. It comes in powder and aerosol spray form (George , Potlapati, 2021).

Shampoo Bars

Despite resembling conventional soap, it generally comprises oils and generates substantial lather. The quantity of preservatives is somewhat diminished due to their function of extracting moisture from the final product. (George , Potlapati, 2021).

Colour protected shampoo

Cationic detergents, known as quaternaries, quaternary ammonium compounds, or quats, enhance manageability by neutralising static electricity associated with the negative (anionic) charge of treated or damaged hair. Due of these attributes, they are an excellent option for persons with permanently coloured or wavy hair. In this type of shampoo , mild detergents are typically present . An instant conditioner can be used in conjunction with these products, although they usually do not include the conditioners found in dry or damaged hair shampoos. (George , Potlapati, 2021).

Professional shampoo

There are shampoos designed to wash hair before cutting it and shampoos designed to come before or after a chemical procedure. Although most salon shampoos are manufactured similarly to retail versions, several serve specialised purposes: Professional anionic and acidic shampoos are employed post-bleaching to eliminate residual alkalinity and prepare the hair for dyeing; cationic and acidic shampoos are utilised following colouring, such as "colour revival shampoos." (George , Potlapati, 2021).

Shampoos for different types of hair

Shampoos using sodium lauryl sulphate (SDS) as the primary detergent are effective at washing the scalp of normal or chemically untreated hair. Amphoteric and anionic detergents are recommended for dry hair and hair that has undergone chemical treatments. Smooth, greasy straight hair may benefit from the volumizing properties of anionic surfactants. Medicated shampoo should be used just to the scalp, particularly for those with dry, damaged hair (George , Potlapati, 2021).

COMPOSITION

- **Principal Surfactants**: These are the primary cleansing agents that remove dirt, oil, and impurities while creating a rich lather.
- **Secondary Surfactants**: Enhance cleansing, stabilize foam, and improve hair conditioning for a gentler wash.(Sushil Kumar Pal *et al*., 2024)
- **Anti-Dandruff Agents**: Natural ingredients like neem, tulsi, and shikakai help combat dandruff, soothe the scalp, and reduce itching.(Gaikwad *et al*., 2018)
- **Conditioning Agents**: Ingredients such as lanolin, mineral oil, fenugreek, henna, and egg derivatives reduce tangles, improve smoothness, and restore the natural protective layer of the hair.(Kumar *et al*., 2023)
- **Foam Builders**: Natural additives like shikakai enhance lather, providing a luxurious washing experience.
- **Viscosity Modifiers**: Compounds like electrolytes, natural gums, and cellulose derivatives adjust the thickness and texture of the shampoo.
- **Sequestrants**: EDTA binds metal ions, preventing soap scum buildup and maintaining effectiveness in hard water.
- **Opacifying Agents**: Ingredients like alkanolamides and zinc stearate add a pearl-like appearance for a premium look.
- **Clarifying Agents**: Alcohols and solubilizers maintain product clarity and ensure consistent formulation.
- **Perfumes**: Herbal, fruity, or floral scents leave hair pleasantly fragrant.
- **Preservatives**: Compounds like parabens and formaldehyde prevent spoilage and ensure a long shelf life.
- **Colours**: Limited to stable shades like green, yellow, and orange, enhancing the product's visual appeal.
- **UV Protectants**: Shield hair from sun damage and prevent color fading.
- **pH Balancers**: Maintain the natural pH of the scalp to prevent irritation and ensure compatibility with hair(Prajwal *et al*., 2023).

Table-1: Herbs used in Preparation of Herbal Shampoo (Kumari *et al*.,2022; Prajwal *et al*.,2023,Gaikwad *et al* .,2018,Narendra *et al*.,2023)

COMMON NAME	BIOLOGICAL NAME	FAMILY	CHEMICAL CONSTITUENTS	USES
Curry Leaves	*Murraya Koenigii*	Rutaceae	Monoterpenes, Alkaloids	Preventing hair fall, Anti-dandruff agent
Sidr	*Zizphus spina-christi*	Rhamnaceae	Flavonoids, Alkaloids	Conditioning agent , provide strengthen in hair follicle
Methi	*Trigonellafoenum*	Legumes	Amino acid, Saponins, carbohydrate	Provides hair shinning
Shikakai	*Acacia Concinna*	Legumes	Tannins, Flavonoids, Alkaloids	Prevent hair loss, Cleanse hair
Soapnut	*Sapindus indica*	Sapindaceace	Saponins(10%-11.5%)& Vitamins, sugar	Act as Detergent and Natural cleanser

Aloe vera	*Aloe barbadenis miller*	Lilaceace	Vitamins, sugar, Minerals, lignin	Provide cooling effect
Henna	*Lawsoniainermis*	Lythraceace	Alkaloids, Naphthoquinone, Terpenes	Promotes hair color
Neem	*Azadirachta Indica*	Melaiaceace	Glycosides, Oxalic acid	Anti -Dandruff agent
Cassia	*Cassia auriculata*	Legumes	Flavonoids, Protein, Steroids	Detergent
Amla	*Phyllanthus emblica*	Eupharbiacea	Phenolic compound	Strengthening hair follicles
Soyamilk	*Glycine max*	Fabceace	Isoflavones, Phytic acid	Protects from heat damage
Tulsi	*Ocimum Sanctum*	Laminaceace	Volatile oil, Flavonoids	Antimicrobial, Anti danti-lice property

Table – 2: Ingredients used for formulation of herbal shampoo (Raut *et al.*,2023)

MATERIAL REQUIRED	QUANTITY	PROPERTIES
Amla	5gm	Anti-Dandruff
Lemon juice	Q.S	Antimicrobial
Bhringraj extract	5gm	Hair growth
Tulsi	5gm	Strengthens hair root
Neem	5gm	Anti-Bacterial activity
Aloe vera gel	10gm	Moisturizer, Thickening agent
Rosemary oil	Q.S	Fragrance
Soapnut	5gm	Detergent
Hibiscus	5gm	Conditioning agent
Water	Q.S	Vehicle
Tulsi *Sanctum*	Laminaceace	Flavonoids	Anti danti-lice property

METHOD OF PREPARATION (Gaikwad et al., 2018)

Collect the herbs and weigh all the ingredients according to the formula . Individually all ingredients are boiled which follows decoction process . And further decoction of these ingredients are filtered and collected . The filtration is performed with muslin cloth . The filtrate are measured and mixed to formulate shampoo . And at last the preservative (rosemary oil) added .

EVALUATION PARAMETERS

1. **ORGANOLEPTIC CHARACTERISTICS:** The organoleptic evaluation of the formulation involved visual inspection for clarity, colour, odour, and froth content. The product was observed to be a viscous, brown liquid with an aromatic odour, with the colour tested against a white background and the odour assessed by smelling.(Nipurte *et al*., 2022)
2. **DETERMINATION OF PH:** The pH of the prepared shampoo was assessed with both pH paper and a digital pH meter. A 1% solution (2 mL shampoo in 200 mL distilled water) and a 10% v/v solution were formulated for examination at ambient temperature.The shampoo's pH was measured as 6.2, indicating an acid-balanced formulation close to skin pH, which enhances hair quality, minimizes skin irritation, and stabilizes scalp pH, with mild acidity promoting shine by tightening hair cuticle scales.(Narendra Bahot *et al*., 2023)
3. **DETERMINATION OF SOLID CONTENT %:** Approximately 4 grams of shampoo was put in a clean, dry, and pre-weighed dish to ascertain the percentage of solid material in the shampoo. The dish was cooked on a hot plate to vaporise the liquid. Once dried, the remaining solid residue was weighed, and the percentage of solids was calculated using a standard formula. This process was repeated for accuracy. Percentage of solids = (Dried weight of shampoo / Initial weight of shampoo) × 100.*(Hanwate et al*., 2023)
4. **SURFACE TENSION MEASUREMENT:** The surface tension of the shampoo was assessed via a stalagmometer with a 10% w/v shampoo solution in distilled water at ambient temperature. The stalagmometer was meticulously cleansed with chromic acid and distilled water to remove oil or other impurities that may influence the findings. Surface tension was determined using the equation: $R3 = (W3 - W1) \times N1 \times R1 / (W2 - W1) \times N2 \times R2$, where W1 represents the weight of the empty beaker, W2 denotes the weight of the beaker containing distilled water, W3 indicates the weight of the beaker with the shampoo solution, N1 signifies the number of drops of distilled water, N2 represents the number of drops of shampoo solution, R1 is the surface tension of distilled water, and R2 is the surface tension of the shampoo solution.(Revansiddappa M *et al*., 2018)
5. **FOAMING STABILITY TEST:** The foaming stability of the shampoo was assessed via the cylinder shake method. A 1% shampoo solution (50 mL) was transferred to a 250 mL graduated cylinder, sealed, and agitated violently 10 times. The foam volume was measured immediately after shaking and thereafter at 1-minute intervals for a duration of 4 minutes. The stability of the foam was evaluated by quantifying the foam volume at each interval, with the cumulative foam volume recorded after one minute.The formulated shampoo produced stable, compact, and dense foam, with a foam volume exceeding 10 mL, meeting consumer expectations for foam stability.(Iqbal Ahmad *et al*., 2023)
6. **DIRT DISPERSION TEST:** The soil dispersion test was conducted to assess the shampoo's cleansing efficacy. Two drops of shampoo were introduced into a big test tube holding 10 mL of distilled water, succeeded by one drop of India ink. The test tube was sealed and shook violently ten times. The quantity of ink in the foam was then evaluated and classified as none, light, moderate, or heavy, reflecting the shampoo's efficacy in filth dispersion.(Sushil Kumar Pal *et al*., 2024)
7. **CONDITIONING PERFORMACE:** The conditioning efficacy of the shampoo was assessed using fake hair strands approximately 10 cm in length, sourced from salons and categorised into control and test groups. The test samples underwent a minimum of ten washes and drying cycles with the designed shampoo, whilst the control samples remained unwashed. The effectiveness of conditioning was evaluated using a blind touch test with 20 student volunteers, who were instructed to manipulate the hair samples and grade the conditioning performance on a scale from 1 to 4, with 4 indicating excellent, 3 good, 2 adequate, and 1 bad.(Gaikwad *et al*., 2018)
8. **DETERMINATION OF VISCOSITY:** The viscosity of the shampoo was measured using a Brookfield viscometer with spindle T95, adjusting the spindle speed between 0.3 and 10 rpm. The size of the sample container and the temperature were maintained constant throughout the experiment to ensure consistent and accurate results.(Narendra Bahot *et al*., 2023)
9. **RHEOLOGICAL EVALUATION:** The rheological properties of the shampoo were evaluated using a Brookfield Viscometer (Model DV-1 Plus, LV, USA) with spindle T95, operating at spindle speeds ranging from 0.3 to 10 rpm. During the study, the temperature and the size of the sample container were kept constant to ensure accurate and reliable viscosity measurements.(Al Badi & Khan, 2014)

10. **SKIN SENSITIZATION TEST:** The skin sensitisation test was performed to assess potential skin irritation induced by the shampoo. The experiment comprised guinea pigs categorised into three groups of seven, with their dorsal fur shaved before the trial commenced. Shampoo was administered to the unprotected skin of the test subjects, while a 0.8% v/v formalin solution served as the standard irritant. Application areas were evaluated and rated for erythema on a scale from 0 to 4, with 0 indicating none, 1 indicating faint, 2 indicating well-defined, 3 indicating moderate, and 4 indicating scar formation (severe). Observations were conducted for a duration of up to 72 hours, with grading executed by the same investigator to ensure consistency.(Pundkar ,Ingale.,2020)
11. **EYE IRRITATION TEST:** The ocular irritation test was performed on six albino rabbits to assess the possible eye irritancy of the shampoo. A 1% shampoo solution was administered into the rabbits' eyes, which were maintained in an open position using lid clips. The consequences were documented at designated time intervals, with observed reactions including haemorrhaging, ulceration, eyelid oedema, iris inflammation, and probable blindness. The degree of ocular damage inflicted by the shampoo was evaluated during an average period of four seconds.(Sanjay Vyavhare *et al*., 2024)
12. **DETERGENCY ABILITY:** The shampoo's detergency was assessed with the Thompson technique. Hair samples, each weighing 3 grammes, were purified using a 5% sodium lauryl sulphate (SLS) solution, subsequently dried, and then treated with a 10% fake sebum solution in n-hexane. The mixture was agitated for 15 minutes at ambient temperature, and the sebum content was assessed following solvent evaporation. The samples were partitioned into two segments, one of which was rinsed with 0.1 mL of the 10% test shampoo, while the other acted as a negative control. Following desiccation, sebum was extracted from the samples utilising 20 mL of n-hexane, and the mass was recorded. The detergent efficacy was subsequently computed as a percentage .(Kumar *et al*., 2023)
13. **STABILITY STUDIES:** The stability of the formulation was evaluated by conducting thermal stability studies. Formulations were contained in glass tubes and kept in a humidity room regulated at 45°C and 75% relative humidity. Their physical stability and looks were evaluated throughout three months at monthly intervals.

Additionally, the stability and acceptability of organoleptic properties, such as odour and colour, were assessed during a two-month storage period, indicating that the formulations remained chemically and physically stable.(Kumar *et al*., 2023)

14. **WETTING TEST:** The wetting time was assessed using canvas discs that weighed 0.44 grams and have a diameter of 1 inch. Each disc was immersed in a 1% w/v shampoo solution, and a timer recorded the period until the disc began to submerge, designated as the wetting time.(Revansiddappa M *et al*., 2018)
15. **SURFACE CHARACTERISTIC:** Hair samples were analysed using scanning electron microscopy (SEM) with a Leo 430 instrument. The samples were affixed to SEM stubs with double-sided adhesive tape and then coated with a 200 nm gold layer under a vacuum of 0.001 mm Hg. Photomicrographs were obtained at suitable magnifications to analyse the surface morphology of the hair samples. (Dewangan,Kumar Harish Sharma ,Gyanesh Kumar Sahu.,2024)

2. CONCLUSION

This study focusses on the development of herbal shampoo. Herbal shampoos sourced from natural plant extracts like shikakai and amla offer a feasible substitute for synthetic conditioners. These formulations promote hair growth, strengthen strands, and reduce hair loss by nourishing the scalp and enhancing hair health. Traditional plant-based ingredients offer a safer, more natural solution to hair care, minimizing the negative effects of synthetic chemicals. Further research can refine these formulations, contributing to the growing demand for natural hair care products.

REFERENCES

[1] Al Badi K, Khan SA. Formulation, evaluation and comparison of the herbal shampoo with the commercial shampoos. Beni-Suef University Journal of Basic and Applied Sciences. 2014;3(4):301-305.

[2] Bhavani MS, Jan SM, Rani KS, Srirekha M. Formulation, evaluation and comparison of the herbal shampoo with commercial shampoos. International Journal of Pharmaceutical Sciences Review and Research. 2023;78(1):41-45.

[3] Dhayanithi S, Enjamamul HOQUE, Pallavi N, Dr. Kavitha PN and Dr. Saraswathi. Formulation and evaluation of herbal shampoo. National Journal of Pharmaceutical Sciences. 2021;1(2):88-93.

[4] Dewangan C, Kumar Harish Sharma Gyanesh Kumar Sahu R. A review on formulation and evaluation of herbal shampoo. 2024;2(5):1050-1057.

[5] Gaikwad PD, Mulay KV, Borade MD, Student KT. Formulation and evaluation of herbal shampoo. International Journal of Science and Research. 2018;9(3):29-30.

[6] George NM, Potlapati A. Shampoo, conditioner and hair washing. International Journal of Research in Dermatology. 2021;8(1):185-189.

[7] Hanwate RM, Hanwate R, Tambe G. Formulation and evaluation of herbal shampoo. International Journal of Scientific Development and Research. 2023;8(6):185-191.

[8] Iqbal Ahmad S, Varma R, Saini M, Bhaduka G, Goyal R. A review article on: herbal shampoo. International Journal of Advance Research and Innovative Idea in Education.2023;9(3):4367- 4370.

[9] Jadhav AV, Daunderkar A, Bhujbal N, Kshirsagar S. Herbal hair cosmetics: an overview. World Journal of Pharmaceutical Sciences. 2018;6(9):144-152.

[10] Kumar S, Bhardwaj P, Verma R, Manglik S, Chauhan D, Tiwari R, Irshad M, Shiva K. An herbal and chemical shampoo formulation, assessment, and comparison. Journal of Pharmaceutical Technology, Chemistry and Physics. 2023a;30:224-229.

[11] Kumari I, Sarkar I, Sanyashi I, Das S, Das R. Formulation and evaluation of herbal shampoo using neem, amla and reetha extract. Journal of Pharmacognosy and Phytochemistry. 2022;11(4):179-184.

[12] Maurya P, Maury S, Yadav P, Yadav K, Maurya S, Jaysawal S. A review article on: herbal shampoo. Journal of Emerging Technologies and Innovative Research. 2021;8(5):366-375.

[13] Narendra Bahot C, Ajinath S, Jain S. Formulation and evaluation of herbal shampoo. International Journal of Innovative Research in Technology .2023;10(1) :296-300.

[14] Nipurte S, Datir MB, Fulsundar AS. A review on formulation and evaluation of herbal shampoo. World Journal of Pharmaceutical Research. 2022;11(3):412-418.

[15] Prajwal M, Bhujbal R, Vishal M, Kopnar P, Kalyanee M, Gavande V, Khedkar AN, Pratik M, Khandagale R. A review on herbal shampoo and its evaluation. International Journal of Forensic Medicine and Research.2023;5(6):1-13.

[16] Pundkar AS, Ingale SP. Formulation and evaluation of herbal liquid shampoo. World Journal of Pharmaceutical Research. 2020;9(5):901-911.

[17] Raut YB, Bais SK, Badure S. A review: an analysis and formulation of the herbal shampoo. International Journal of Pharmacy and Herbal Technology;2023;1(3):132-140.

[18] Revansiddappa M, Sharadha R, Abbulu K. Formulation and evaluation of herbal anti-dandruff shampoo. Journal of Pharmacognosy and Phytochemistry. 2018a;7(4):764-767.

[19] Road N. Formulation and evolution of herbal shampoo. International Journal of Novel Research and Development. 2024a;9(6):216-236.

[20] Sakshi More. Formulation and evaluation of herbal shampoo. International Journal of Pharmaceutical Science .2024;2(8):2733-2739.

[21] Sanjay Vyavhare D, Rathi G, Gaikwad M, Tangde P, Umap D. Natural hair care: formulating and evaluating a herbal shampoo blend. EPRA International Journal of Research and Development. 2024;9(6):44-55.

[22] Sharma A, Virk S. A narrative review on herbal shampoo. The Pharmaceutical and Chemical Journal. 2023;10(4):20-29.

[23] Sonawane SK, Shinde PP, Shelke SJ. Shampoos: hair care cosmetics. Research Journal of Topical and Cosmetic Sciences. 2021;12(2):102-106.

[24] Sushil Kumar Pal, Shashank Tiwari, Sunil Mishra, Sachit Saran. Formulation and evaluation of herbal shampoo. International Journal of Life Science Research Archive. 2024a;7(2):043-057.

[25] Thakur A, Pandit V, Ashawat MS. A review on herbal shampoo. World Journal of Pharmaceutical Research. 2020;9(8):1132-1137.

[26] Vinchu M, Kotame R, Vinchu MM, Kotame PR. A review on formulation and evaluation of herbal shampoo. International Journal of Creative Research Thoughts. 2022;10(11):e396-e400.

..