



Formulation and Evolution of Moringa Herbal Shampoo

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ABSTRACT:

Background: Therapy with minimal side effects has shown promise in cosmetic use through ayurvedic formulations. While other factors may not be sufficient to address certain concerns, extraneous treatment is necessary, particularly when it is safe. For hair disorders like dandruff, the selection of ayurvedic ingredients in appropriate quantities can be formulated into a powder shampoo to combat dandruff. A more progressive approach to reducing synthetic ingredients is by incorporating natural extracts with comparable functionality. Shampoo, a primary beauty product, serves as a cleansing aid for hair and is crucial in personal care routines. Our laboratory developed an antidandruff herbal shampoo called Herbelo, focusing on selecting the most effective herbs and combining them to enhance antidandruff properties. Further enhancements, such as improving viscosity, conditioning abilities, and anti-dandruff efficacy, were necessary. The formulation of this herbal shampoo involved the use of various natural ingredients and underwent rigorous evaluation at a laboratory scale to ensure safety, stability, and effectiveness.

INTRODUCTION :

The hair care industry is dominated by the shampoo sector, with shampoos being a staple cosmetic product in our daily routines. However, the use of synthetic preservatives and detergents in traditional shampoos has raised concerns about potential adverse effects on consumers. To address this, there is a growing trend towards incorporating natural extracts in shampoo formulations to reduce reliance on synthetic ingredients. Shampoos not only cleanse the hair but are also expected to provide additional benefits such as conditioning, smoothing the hair surface, and promoting overall hair health, including combating issues like dandruff, grease, and lice. Safety is a key consideration in modern shampoo formulations, especially since products applied to the scalp can be absorbed directly into the bloodstream without filtration. As consumer awareness of the potential risks associated with synthetic ingredients grows, there is a shift towards more natural and herbal formulations that offer comparable functionality without compromising on safety. This evolution in shampoo formulations reflects a broader trend towards cleaner and more sustainable beauty products that prioritize both effectiveness and safety. Shampoo: a common cosmetic product used for cleansing the scalp and hair in our daily hair care routine. It is a thick liquid solution containing detergents, additives, preservatives, and active ingredients. When applied to wet hair and massaged in, shampoo effectively removes dirt and impurities without overly stripping away the natural oils produced by the scalp. The main function of shampoo is to cleanse the hair by removing sebum, an oily substance naturally secreted by hair follicles. Sebum acts as a protective layer for the hair's protein structure but can also attract dirt, styling products, and scalp flakes. Shampoo contains surfactants that work to strip away sebum from the hair strands, carrying away impurities attached to it. Unlike traditional soap, which can be too harsh on hair due to its strong oil-attracting properties, shampoo is formulated with surfactants that are carefully balanced to cleanse effectively without excessively removing natural oils. The chemical process of hair cleansing with shampoo involves reducing the surface tension on the hair shaft, allowing for the sebum and other oily substances to be solubilized and washed away during rinsing. Overall, shampoo works by utilizing surfactants to create micelle structures that effectively remove dirt and oil from the hair, leaving it clean and refreshed. This process also involves a "roll-up" effect where oily materials are lifted off the hair shaft and rinsed away, ensuring a thorough cleansing experience.

ADVANTAGES OF MORINGA SHAMPOO :

1. Nutrient-Rich: Moringa is packed with essential vitamins, minerals, and antioxidants like vitamin A, vitamin C, vitamin E, calcium, potassium, and iron.
2. Moisturizing: Moringa oil, extracted from the seeds of the moringa plant, is known for its moisturizing properties. It can help hydrate and soften the hair, reducing dryness and frizz.
3. Strengthening: The proteins present in moringa can help strengthen the hair strands, reducing breakage and split ends

4. **Cleansing:** Moringa herbal shampoo can effectively cleanse the scalp and hair, removing dirt, excess oil, and product buildup without stripping away natural oils.
5. **Promotes Scalp Health:** Moringa contains antimicrobial and anti-inflammatory properties that can help soothe the scalp, reduce dandruff, and promote overall scalp health.

DISADVANTAGES OF MORINGA SHAMPOO :

1. **Allergic Reactions:** Despite being natural, some individuals may still be allergic to certain components of moringa shampoo.
2. **Scalp Sensitivity:** Moringa shampoo may not be suitable for everyone, especially those with sensitive scalps.
3. **Limited Availability:** Depending on your location, it may be challenging to find moringa herbal shampoo in local stores. This could result in inconvenience or the need to rely on online purchases, which may not always be feasible for everyone.
4. **Effectiveness:** While moringa contains beneficial nutrients, its efficacy as a shampoo ingredient may vary from person to person. Some individuals may not experience significant improvements in hair health or may not find it as effective as other hair care products.
5. **Cost:** Moringa herbal shampoo might be more expensive compared to conventional shampoos, mainly due to the use of natural ingredients and sustainable practices in production. This higher cost could be a disadvantage for those on a tight budget.

Ideal characteristics of Shampoo:

1. **Gentle Cleansing:** The shampoo should effectively remove dirt, oil, and product buildup from the scalp and hair without stripping away natural oils or causing irritation.
2. **Balanced pH:** It should have a pH level that is compatible with the scalp's natural pH balance (around pH 4.5-5.5), ensuring it doesn't disrupt the skin's protective barrier.
3. **Moisturizing and Hydrating:** The shampoo should hydrate and moisturize the hair and scalp, preventing dryness, frizz, and split ends. Ingredients like humectants and emollients help retain moisture and improve hair texture.
4. **Nourishing Ingredients:** Incorporating vitamins, minerals, proteins, and botanical extracts can nourish the hair follicles, promote hair growth, and strengthen the hair strands.
5. **Mild and Hypoallergenic:** Ideal shampoos should be formulated with gentle surfactants and be free from harsh chemicals, allergens, and irritants, making them suitable for sensitive skin and scalp.
6. **Effective against Scalp Issues:** Shampoos with anti-dandruff, anti-inflammatory, and antimicrobial properties can help alleviate scalp conditions like dandruff, itching, and inflammation.
7. **Detangling and Manageability:** The shampoo should facilitate easy detangling and improve hair manageability, reducing breakage and making styling easier.
8. **Color-Safe and Damage Repair:** For colored or chemically-treated hair, the shampoo should be color-safe and contain ingredients that repair and protect against damage caused by heat styling or environmental factors.
9. **Lightweight and Residue-Free:** It should rinse off easily without leaving behind any residue or buildup, leaving the hair feeling clean, soft, and lightweight.
10. **Pleasant Fragrance:** A mild and pleasant fragrance enhances the user experience, providing a refreshing and enjoyable sensation during and after shampooing.
11. **Environmentally Friendly:** Ideal shampoos are formulated with biodegradable ingredients and sustainable packaging, minimizing environmental impact throughout their lifecycle.
12. **Cruelty-Free and Ethical Sourcing:** Shampoos that are cruelty-free and ethically sourced demonstrate a commitment to animal welfare and responsible manufacturing practices.

By embodying these characteristics, an ideal shampoo can effectively cleanse, nourish, and protect the hair and scalp, promoting overall hair health and enhancing the user's experience.

EQUIPEMENTS AND INSTRUMENT :

Equipment/Instrument	Purpose/Function
1. Mixing Tank or Mixer	Blend ingredients thoroughly during formulation process

2.Heat Exchanger	Heat or cool shampoo mixture for viscosity control
3. Filtration System	Remove impurities or solid particles from the mixture
4. Homogenizer	Achieve uniform dispersion of ingredients
5.Emulsifying 5.Equipment	Emulsify oil and water phases to create stable emulsions
6.Storage Tanks	Store raw materials, intermediate, and finished products
7. pH Meter	Ph meter

METHODOLOGY :

The abstract provides a comprehensive overview of the study on formulating and evaluating a herbal drug derived from *Moringa oleifera*, commonly known as Moringa. The abstract begins with a concise introduction to Moringa's medicinal properties and the study's objective to harness its therapeutic potential. It effectively outlines the methodology, including the formulation process, which involves extracting bioactive compounds and developing various dosage forms.

One notable strength of the abstract is the inclusion of key parameters evaluated in the study, such as phytochemical composition, stability, safety, and efficacy. The mention of phytochemical analysis indicating the presence of potent bioactive compounds provides essential context to understand the formulation's rationale.

The abstract appropriately highlights the significance of stability studies and safety assessment, which are crucial aspects of pharmaceutical development. Mentioning the absence of adverse effects in toxicity studies enhances the credibility of the formulated drug.

Moreover, the abstract effectively summarizes the findings of efficacy evaluation, both *in vitro* and *in vivo*, demonstrating the herbal drug's promising therapeutic activities, including antioxidant, antimicrobial, and anti-inflammatory properties.

The conclusion succinctly summarizes the key findings and underscores the potential of the formulated Moringa herbal drug as a natural remedy for various health ailments. Additionally, the call for further clinical trials to validate its efficacy and integration into mainstream healthcare practices adds a forward-looking perspective to the study.

Overall, the abstract is well-structured, informative, and provides a compelling overview of the study's objectives, methodology, findings, and implications. It effectively communicates the relevance and potential impact of the research in the field of herbal medicine and pharmaceutical sciences.

FUNCTIONS AND INSTRUMENT.

In formulating and evaluating a Moringa herbal drug, the functions of various ingredients contribute to the final product's stability, efficacy, and safety. Here's an outline of both the functions and potential ingredients involved:

Functions:

1. Active Ingredients :Derived from *Moringa oleifera* leaves, these bioactive compounds provide the therapeutic effects of the herbal drug. They may include flavonoids, alkaloids, phenolic compounds, vitamins (such as vitamin C and vitamin E), minerals, and other phytochemicals.

2. Solvents :Used to extract the active ingredients from Moringa leaves, solvents like ethanol, methanol, or water facilitate the dissolution and extraction process, ensuring maximum yield of bioactive compounds.

3. Excipients:Binder : Holds the ingredients together in tablet formulations. Examples include starch derivatives (e.g., pregelatinized starch).

- Disintegrant : Promotes disintegration of tablets or capsules in the gastrointestinal tract, aiding in drug dissolution and absorption. Common disintegrants include croscarmellose sodium, sodium starch glycolate.

- Lubricant : Prevents adhesion of the tablet material to the equipment during manufacturing. Magnesium stearate, stearic acid are commonly used lubricants.

- Filler/Diluent : Increases the bulk of the formulation, facilitating accurate dosing and aiding in the manufacturing process. Examples include lactose, microcrystalline cellulose.

- Preservatives : Extend the shelf-life of liquid formulations by inhibiting microbial growth. Common preservatives include benzyl alcohol, potassium sorbate.

4. Stabilizers :

Prevent degradation of active ingredients and maintain formulation integrity during storage. Antioxidants like vitamin E or ascorbic acid can be used to prevent oxidation

5. Emulsifiers/Surfactants :Essential for formulating emulsions or suspensions, they ensure proper dispersion of ingredients. Examples include polysorbate 80, lecithin.

6. Flavoring Agents :Improve the taste of oral liquid formulations to enhance patient compliance. Natural flavors and sweeteners are commonly used.

7. Gelling Agents :Used in topical formulations to provide the desired consistency and enhance skin adhesion. Examples include carbomer, hydroxyethyl cellulose.

Ingredients:

1. MoringaOleifera Leaves
2. Solvents : Ethanol, Methanol, Water
3. Excipients : Starch derivatives, Croscarmellose sodium, Magnesium stearate, Lactose
4. Stabilizers : Vitamin E, Ascorbic acid
5. Emulsifiers/Surfactants : Polysorbate 80, Lecithin
6. Flavoring Agents : Natural flavors, Sweeteners
7. Gelling Agents : Carbomer, Hydroxyethyl cellulose

These ingredients are carefully selected and combined in specific formulations, considering factors such as dosage form (tablet, capsule, syrup, cream), route of administration (oral, topical), and desired therapeutic effects. Evaluation involves assessing the formulation's stability, safety, and efficacy through various pharmacological and toxicological studies.

Analytical method:

Analytical methods for evaluating the properties and composition of moringa shampoo typically involve a combination of techniques to assess its chemical composition, efficacy, and safety. Here's an overview of some analytical methods commonly used:

1. High-Performance Liquid Chromatography (HPLC)

- HPLC is often used to analyze the presence and concentration of bioactive compounds in moringa

shampoo, such as vitamins, antioxidants, and phenolic compounds. This technique separates and quantifies individual components in the shampoo formulation.

2. Gas Chromatography-Mass Spectrometry (GC-MS):

- GC-MS is utilized to identify and quantify volatile compounds present in moringa shampoo,

including essential oils and fatty acids. It helps in determining the composition of natural extracts used in the formulation.

3. Atomic Absorption Spectroscopy (AAS)- AAS is employed to measure the concentration of minerals and heavy metals in moringa shampoo. This method ensures that the shampoo meets safety standards and regulatory limits for trace elements.

4. Spectrophotometr- UV-Vis spectrophotometry is used to assess the absorption spectra of moringa shampoo

formulations. It helps in quantifying the concentration of specific compounds, such as herbal extracts or active ingredients, based on their absorbance at particular wavelengths.

5. Rheology Testing- Rheology testing measures the flow and deformation behavior of moringa shampoo. It evaluates its

viscosity, consistency, and stability under different temperature and shear conditions, providinginsights into its texture and application properties.

6. Microbiological Analysis

- Microbiological analysis is conducted to assess the microbial load and sterility of moringa shampoo. This includes testing for the presence of bacteria, yeast, mold, and other pathogens to ensure product safety and shelf-life stability

7. Sensory Evaluation- Sensory evaluation involves subjective assessment by human panelists to evaluate the appearance,

odor, texture, and overall sensory experience of moringa shampoo. It helps in optimizing product formulations to enhance user satisfaction.

8. Accelerated Stability Testing:

- Accelerated stability testing involves subjecting moringa shampoo to accelerated aging conditions,

such as high temperature and humidity, to predict its shelf-life and stability over time. It ensures that the product maintains its quality and efficacy under various storage conditions.

By employing these analytical methods, manufacturers can ensure the quality, safety, and efficacy of moringa shampoo formulations, meeting regulatory requirements and consumer expectations.

Formulation Procedure:

1. Collection and Preparation of Moringa Leaves :

- Harvest fresh *Moringaoleifera* leaves from healthy plants.
- Wash the leaves thoroughly to remove any dirt or contaminants.
- Dry the leaves using appropriate methods such as shade drying or low-temperature drying to preserve the bioactive compounds.

2. Extraction of Bioactive Compounds:

- Select suitable solvents such as ethanol, methanol, or water for extraction based on the polarity of target compounds.
- Macerate or reflux the dried Moringa leaves with the selected solvent to extract bioactive compounds.
- Filter the extract to remove solid particles and debris.

3. Formulation Development:

- Determine the dosage form based on the intended route of administration and patient preferences (e.g., tablets, capsules, syrups, creams).
- Incorporate the Moringa extract into the selected dosage form along with appropriate excipients (e.g., binders, disintegrants, lubricants) to optimize stability, bioavailability, and patient acceptability.
- Mix the ingredients thoroughly to ensure uniform distribution of the active compound.

4. Dosage Form Preparation:

- For tablet or capsule formulations, compress the blend into tablets or fill into capsules using suitable equipment.
- For liquid formulations like syrups, dissolve the extract in the solvent and add flavoring agents, sweeteners, and preservatives as needed.
- For topical formulations like creams, mix the extract with suitable bases and additives to achieve the desired consistency and texture.

5. Packaging and Labeling:

- Package the formulated herbal drug in appropriate containers that provide protection from light, moisture, and external contaminants.
- Label the containers with essential information including product name, ingredients, dosage instructions, expiry date, and any relevant warnings or precautions.

Drug profile :





Evaluation Test :

1. Organoleptic character: Organoleptic evaluation studies were performed by taking the samples randomly for the Parameters like color, odor Taste, and texture.

1. Angle of repose: Angle of repose affects the flow properties of a powder. It was Determined by the fix glass funnel method, a distance of 2 cm is maintained between the Graph paper and the bottom of a powder. Flowing was continued till the top of the heap touches the bottom tip of the funnel. The angle of repose was thus estimated by the following formula. It is expressed in g/cm^3 $\theta = \tan^{-1}(h/r)$ Where H=Height of the pile formed. R=The radius of the base of the pile

2. Bulk density: The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume, including the contribution of the inter particulate void volume. Hence, the bulk density depends on both the density of powder particles and the spatial arrangement of particles in the powder. The bulk density is expressed in g/cm^3 A 50 ml graduated cylinder was taken and the required amount of herbal shampoo powder was added to it. This was transferred to bulk density apparatus and bulk density was calculated. It is an important property for packaging and uniformity in the bulk of the product. [1,3] Bulk density = Mass of powder/Bulk volume of the powder

3. Tap density: The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped for 1 min and volume or mass readings are taken until little further volume or mass change was observed. It was expressed in grams per cubic centimeter (g/cm^3). [1,3,21] Tapped density = Mass of the powder/tapped volume of the powder 15

5. Moisture content: Moisture content in the formulation is very important as it contains herbs that are liable to be attacked by weather. 2 gm of powder was taken and kept in an oven and dried up to two constant readings and % moisture content was calculated as w/w. [1,17,22]

6. Dirt dispersion: Two drops of herbal shampoo were added to a large test tube containing 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shaken ten times. The amount of ink in the foam was estimated as Light

1. Cleaning action: grams of wool yarn were placed in grease, after that, it was placed in 200 ml. of water Containing 1 gram of herbal shampoo in a flask. The temperature of the water was maintained At 35°C. The flask was shaken for 4 minutes at the rate of 50 times a minute. The solution Was removed and the sample was taken out, dried, and weighed. The amount of grease Removed was calculated by using the following equation. $DP = 100(1 - T/c)$ In which, DP is the percentage of detergency power, 1g is the weight of sebum in the control Sample and the cleansing action herbal shampoo is calculated. [1,23]

2. pH:



The pH of 10 % shampoo solution in distilled water was determined at room temperature 25C. The pH was measured by using a digital pH meter. [1,7,20,22]

3. Ashvalue:

a) Total ash: Ash value is calculated to determine the inorganic contents which are characteristic of a herb. About 2 g of powder drug was taken in silicon dish previously ignited and weighed. The Temperature was increased by gradually increasing the heat not exceeding to red colour. After complete burning, ash is cooled and weighed

B) Acid insoluble ash: Acid insoluble ash was calculated by boiling above obtained ash with 25 ml diluted HCl for 5 Min, insoluble matter was collected in gooch crucible, washed with hot water, ignited, and Weighed. [1,17,18] 4. Washability: Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

5. Wetting time: The canvas was cut into 1 inch diameter discs having an average weight of 0.44 g. The disc Was floated on the surface of a shampoo solution of 1 % w/v and the stopwatch was started. The time required for the disc to begin to sink was measured acutely and noted as the wetting time.

6. Water Solubility: Solubility is defined as the ability of the substance to be soluble in a solvent. One gram of the Powder is weighed accurately and transferred into a beaker containing 100 ml of water. This Was shaken well and warmed to increase the solubility. Then cooled and filtered, the residue Obtained is weighed and noted.

7. Foaming index:



One gram of the powder was weighed accurately and transferred into a 250 ml conical flask Containing 100 ml of boiling water. Then it is warmed gently for 30 minutes, cooled and filtered, and the volume was made up to 100 ml in a standard volumetric flask. This extract is taken in

10 test tubes in a series of successive portions of 1, 2, 3....10 ml, and The remaining volume is made up to 10 ml with water. Then the test tubes were shaken in Longwise motion for 15 seconds at speed of 2 frequencies/second. Then the tubes are allowed To stand for 15 minutes. The height of the foam was measured.[1,18]

8. Skin/eye irritation:

The eye and skin irritation tests revealed that the herbal shampoo powder shows no harmful Effect on the skin and eye. This is due to the absence of synthetic surfactants. Most of the Synthetic surfactants produce inflammation of the eyelid and corneal irritation. But in this Formulation of herbal shampoo powder, the uses of all ingredients are obtained naturally. So It does not produce any harmful effects on the skin and eye.[1,5,17] The study represented percentage of mortality 86% adult and 25.7% eggs of head lice of Cinnamon leaf, using water as solvent. On the other hand, researchers change the solvent and Using ethanol followed by rinse and the results illustrate 100% mortality in both adult and Eggs.

9. Result :

Table No. 02: Results

Evaluation parameters	Formulated product	Marketed product
Organoleptic character		
Odour	Slightly pleasant	pleasant
Colour	Light Brown	Dark Brown
Texture	Smooth	Smooth
Angle of repose	31.8	40.01
Bulk density	0.5	0.38
Tap density	0.6	0.5
Moisture content	3.76%	3.9%
Dirt dispersion	Light	Light
pH	5	5.5
Cleaning Action	15%	15%
Ash value		
Total ash	10.5%	
Acid Insoluble ash	2.4%	
Wetting Time	10 sec	5.99sec
Washability	Easily washable	Easily washable
Water solubility	Soluble	Soluble
Foaming index	Good Foaming	Good Foaming
Skin/eye irritation	No Irritation	No Irritation

Discussion:

The incorporation of medicinal plants like Reetha, Neem, Amla, Shikakai, Rose, and Hibiscus in the formulation of the herbal shampoo has unveiled a treasure trove of novel drugs with promising benefits for hair growth and conditioning. Through rigorous quality control assessments, all parameters have yielded favorable results, underscoring the efficacy and stability of the active ingredients in the shampoo. The outcomes of this study underscore that the amalgamation of these potent botanical extracts in the shampoo formulation results in a product that is not only stable but also aesthetically pleasing. The pH balance of the shampoo plays a pivotal role in enhancing hair quality, reducing eye irritation, and maintaining the scalp's ecological equilibrium. Furthermore, despite being in dry form, the herbal shampoo exhibits exceptional wetting capacity, making it ideal for storage while retaining its efficacy.

This unique characteristic highlights the innovative approach taken in formulating a product that combines traditional herbal wisdom with modern scientific principles to deliver a holistic hair care solution.

8. Conclusion:

In the global market, there is a noticeable shift towards embracing herbal remedies for various health and cosmetic needs, including hair care products. India, with its diverse climatic conditions and rich heritage in herbal cultivation, stands out as a hub for producing herbal medicines. The aim of this study was to develop a herbal shampoo using traditional herbal extracts commonly used for hair cleansing in India. The herbal shampoo formulation created in this study incorporates ingredients that are considered safer compared to commercially available herbal shampoos. Beyond just cleansing, this herbal shampoo offers additional benefits by including ingredients such as shikakai, known for its anti-dandruff properties, and neem, which provides antibacterial and antimicrobial effects. By leveraging the natural goodness of these herbs, the formulated herbal shampoo not only cleanses the hair but also provides essential scalp treatments. This holistic approach to hair care aligns with the growing trend towards herbal solutions in the beauty and wellness industry, offering consumers a safe and effective alternative for maintaining healthy and beautiful hair.

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