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PREPARATION AND EVALUATION OF POLYHERBAL ANTI-DANDRUFF SHAMPOO FROM KEY LIME AND SESAME

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ABSTRACT:

In the present scenario, herbal shampoos are expected to be popular as they are safer and better performing than their synthetic counterparts. However, a more radical approach to making herbal shampoos is to change the expectations of the consumers. The objective of this study is to formulate and evaluate poly-herbal shampoo for cosmetic purpose from herbal ingredients such as Key lime extract, Sesame extract, Bhringraj powder, Neem powder, Amla powder, Shikakai powder, Reetha powder was procured from local market in powdered form also in the extract form, then prepared decoction of these ingredients and mixing with each other and evaluated for its organoleptic and physico-chemical characteristics. Herbal shampoo is used to cleansing of the hair also conditioning, smoothing, of the hair surface, good health of hair, hair free of dandruff, dirt grease and lice above all, its safety benefits are expected. The advantages of herbal cosmetics is their non-toxic nature, reduce the allergic reactions and time-tested usefulness of many ingredients. Thus, in present work, we found good properties for the Polyherbal shampoo of Key lime extract and Sesame extract and further optimization study benefits of herbal shampoo on human use as cosmetic product.

KEYWORDS: Poly-herbal Shampoo, Key lime, Sesame, Anti-Dandruff

INTRODUCTION:

A shampoo can be described as a surfactant preparation; (i.e., Surface active material) in a suitable form-liquid, solid, or powder which when used under the conditions specified will remove surface grease, dirt and skin debris from the hair, shaft and scalp without affecting adversely the hair, scalp or the health of the user [1]. A high level of sebum occurs by dandruff on the skin in various areas. Its symptoms are redness, flakes, and itching of the scalp, hair breakage, and unexpected hair color and skin discoloration [2].

The English term shampoo dates back to 1762, meaning "massage." The term derives from Anglo-Indian's shampoo, in effect from Hindi champoo imperative of champana to rub, knead the muscles, massage. Today, there are plenty of shampoos for men and women available. A good shampoo will form ample foam almost instantly regardless of the type of water used or the amount of soil or fat that needs to be removed from the hair. Though foam formation is not released to the cleansing effect, but people psychologically always prefer a high foam product. Some good shampoos are found to have side effects like drying effect on the hair. It makes hair too dry to be handled or combed with. So proper conditioning of the hair is also an important consideration, some shampoos cause irritation to the eye and a lasting corneal cloud. These should be avoided. The functions of shampoo are expected to be various. A good and acceptable shampoo should have the good characteristics [1].

1. Different Diseases Associated With Scalp Hair:

- Mycotic Conditions
- Dandruff
- Seborrheic dermatitis
- Tinea capitis
- Parasitic Infestation
- Pediculosis capitis
- Inflammatory Conditions
- Psoriasis

2. Classification of Shampoo:

2.1 Types of Shampoo:

Various types of shampoos are available and they are classified based on their consistency.
They are as follows:

1. Clear liquid shampoos
2. Liquid cream shampoos
3. Cream shampoos
4. Gel shampoos
5. Powder shampoos
6. Aerosol shampoos (Foam type)
7. Special shampoos

2.2 Categories of Shampoo Surfactant:

There are five categories of surfactant used in shampoo:
1) Anionics
2) Cationic
3) Non-Ionics
4) Amphoteric
5) Natural

Each of this group possesses different hair cleansing and conditioning qualities. For a shampoo that is intended for oily hair, detergents with strong sebum removal qualities are selected, but if it is intended for permanently waved or dyed hair, mild detergents are selected to reduce sebum removal. Modern shampoos contain a mixture of surfactants (usually between two and four) for providing optimum cleaning levels according to hair type and

requirement—normal, oily, dyed, permed, colored or damaged hair. The detergent listed first denotes the primary cleanser which is in highest concentration and the detergent listed second is the secondary cleanser designed to offset the short comings of the primary detergent [24].

Table no.1 Basic shampoo ingredient formulation and functions [23]

Detergents	Functions to remove environment dirt, styling products, sebum, and skin scales from the hair and scalp.
Foaming Agent	This agent allows the shampoo to form suds, as consumers equate cleansing with foaming even though the two are unrelated.
Conditioners	Leave the hair soft and smooth after sebum removal by the detergent.
Thickeners	Thicken the shampoo, as consumers feel that a thick shampoo works better than a thin shampoo.
Opacifiers	Added to make a shampoo opaque as opposed to translucent for aesthetic purposes, unrelated to cleansing.
Sequestering Agents	Functions to prevent soap scum from forming on the hair and scalp in the presence of hard water; The basic difference between a liquid shampoo and a bar cleanser.
Fragrance	Added to give the shampoo a consumer-acceptable smell.
Preservatives	Prevent microbial and fungal contamination of the shampoo before and after opening.
Specialty Additives	Treatment ingredients or marketing aids added to impart other benefits to the shampoo, besides hair and scalp cleansing.

3. Polyherbal Shampoo:

Since ancient times, people have been using herbs and herbal extracts for cleaning, beautifying and managing hair. Nowadays, in accordance with an actual trend, cosmetic products formulated with natural ingredients are starting to be used again [23-24].

Interestingly, there is a large number of plants having beneficial effects on hair and being commonly used in shampoos for their content of vitamins, amino acids, sugars, glycosides, Phyto-hormones, bioflavonoids, fruit acids and essential oils. Accordingly, various studies on shampoos based on natural ingredients such as Key lime and Sesame have been developed. In particular, these products must be safe and efficient for long-time use [26].

Although these plant products can be used either in their powdered form, crude Form, purified extracts, or derivative form [27] the preparation of an herbal shampoo using only Natural materials (milder and safer than the synthetic ingredients), able to compete with traditional Shampoos in terms of foaming, detergency and solid content, ends up being very difficult [26]. Formulated herbal shampoos mainly using the pericarp of Sapindus mukorossi, commonly known as Soapnut or Reetha, the fruits of Phyllanthus emblica (Amla), and dried pods of Acacia concinna (Sheekakai), that have been traditionally used in India for centuries to wash hair [26]. Their high content in saponins, Reetha and Sheekakai ingredients produce a rich lather when shaken with water, also giving advantageous effects on skin that make them important ingredients for cosmetic applications [28]. In addition, Reetha, Key lime, Sesame and Sheekakai are each characterized by peculiar properties. For example, the Key lime extract and Sesame extract, nourishing hair, can help hair growth and, thanks to the presence of fatty acids penetrating through the scalp, can remove dryness and dandruff, while its antioxidant properties strengthen hair roots [29].

Reetha, instead, among all its properties, could be considered a mild cleansing agent, which, thanks to its antimicrobic properties, can remove any microorganism responsible for infections. Furthermore, it makes hair shine, restoring. The natural hair texture [29]. About Sheekakai, it is reported that it retains the natural oil of hair, keeps Hair lustrous, reduces hair loss, adds volume, gives hair strength, and is a powerful antidandruff and Conditioning agent [29].

Other common herbal ingredients used for shampoo formulation are: Azadirachta indica (Neem) As antibacteric, Ocimum sanctum (Tulsi) that contains vitamins, antioxidants, oligoelements, having also antibacterial properties, Aloe vera (aloe) as conditioning agents, Terminalia chebula (harda, haritaki) and Terminalia bellirica (bahera), with proven efficacy in preparation for hair care [26].

4.1 Ingredients Generally Used In Polyherbal Anti-Dandruff Shampoo Preparation:

Key lime extract, Sesame extract, Neem powder, Bhringraj powder, Tulsi extract, Reetha, Shikakai powder and Amla many more naturally occurring herbs were used in the Preparation of the polyherbal Anti-Dandruff Shampoo formulation.

RESEARCH METHODOLOGY:

Method of Preparation of Shampoo:

Preparation of anti-dandruff shampoo: Shampoo was formulated using simple mixing process. Herbal anti-dandruff shampoo was formulated by adding the required amounts of herbal ingredients as given in the formulation table no 1.
The plant extracts were mixed in different proportions to obtain a shampoo whose formula is shown in Table 1. Herbal Extracts were added to glycerine and were mixed by shaking for 20 min. All the ingredients were also added with stirring. Finally, the pH of the solution was adjusted by adding sufficient quantity of 1% citric acid Solution. The Herbal anti-dandruff shampoo was prepared by simple mixing process. The ingredients used in the shampoo are Reetha as Surfactant, Xanthum gum is used as thickening agent [40].

Preparation Process:

1. All the plant materials were collected from Ayurveda store.
2. All the ingredients were accurately weighed and soaked in water overnight individually.
3. Then the ingredients are boiled in the same water.
4. Later the mixture was cooled, filtered and collected.
5. Then thickening agents were added and the solution were gently stirred.
6. Later preservatives, coloring agents &Perfuming agents are added to the mixture and gently stirred.
7. Finally, shampoo was prepared and stored in a container

1. Weighing: All required herbal ingredient for shampoo preparation were accurately weighed individually by using digital balance.

2. Mixing: They are prepared by simple mixing process in case of clear liquid shampoo. The detergent is first dissolved in half of with first part other of water and then perfume is added last. Mix all the ingredient together and perfume finally to mixed and triturate further.

3. Storage: Store in suitable container.

Table no.2 Formulation of Polyherbal Anti-Dandruff Shampoo

Ingredients	Quantity taken			Role of Ingredients
	F1	F2	F3	
Key lime Ext. (ml)	2.0	1.5	1.0	Promote hair growth and Anti-Dandruff
Sesame Ext (ml)	1.5	1.0	0.5	Anti-Oxidants properties and Anti-Dandruff
Bhringraj Powder (gm)	2.0	2.0	2.0	Anti-Dandruff
Shikakai Powder (gm)	1.0	1.5	2.0	Anti-Fungal and Saponin
Neem (gm)	1.5	1.5	1.5	Anti-Inflammatory and Anti-Dandruff
Tulsi (gm)	1.0	1.0	1.0	Stop premature greying and Improve Blood circulation
Reetha (gm)	5.0	5.0	5.0	Surfactant and Anti-inflammatory
Glycerin (ml)	1	1	1	Viscosity enhancer
Xanthan Gum (ml)	q. s	q. s	q. s	Viscosity enhancer
Water (ml)	q. s	q. s	q. s	Vehicle
Citric Acid (ml)	0.5	0.5	0.5	Neutralizer
Total	80 ml	80 ml	80 ml	

EVALUATION PARAMETERS:

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density and viscosity were performed. Also, to assure the quality of products, specific tests for shampoo formulations including the determination of dry residue and moisture content, total surfactant activity, salt content, surface tension, detergency tests were carried out.

1. PHYSICAL APPEARANCE AND ORGANOLEPTIC EVALUATION:

The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity [41].
By utilizing sensory organs like eyes or nose, the examination of the formulation is performed under this evaluation, and it includes macroscopic characteristics of the drug or product, such as color, odor, and taste. The texture and appearance are also included under macroscopic features, as elaborated in Table 5. [42].

2. CLEANSING ACTION:

The result of detergency ability, when compared with the marketed formulation and it was found between 30-33%. Normally it is considered that forming ability of natural shampoo is not comparable with its synthetic counterpart. But the study proves that combination of natural surfactants such as reetha in optimized concentration can generate sufficient foam for the shampoo. This data may prove the ability of natural surfactants like reetha in optimized concentration as the best replacement for the harsh synthetic detergents. The anti-dandruff activity of developed formulation showed positive results. Marketed formulation possesses lower anti-dandruff activity as compared with our formulation. Formulated shampoo (test sample) is more stable than the (control sample) 1, 2, 3 formulations (meera).

3. DETERMINATION OF pH:

The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C. [43]

4. DETERMINE PERCENT OF SOLIDS CONTENTS:

A clean dry evaporating dish was weighed and added 4 grams of shampoo to the evaporating dish. The dish and shampoo were weighed. The exact weight of the shampoo was calculated only and put the evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the shampoo only (solids) after drying was calculated. [44]

5. SURFACE TENSION MEASUREMENTS:

Was done out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water. The data calculated by following equation given bellow: where W1 is weight of empty beaker. W2 is weight of beaker with distilled water. W3 is Weight of beaker with shampoo solution. N1 is no. of drops of distilled water. N2 is no. of drops of shampoo solution. R1 is surface tension of distilled water at room temperature. R2 is surface tension of shampoo solution. [45]

6. DIRT DISPERSION:

Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy. [46]

7. FOAMING ABILITY AND FOAM STABILITY:

Cylinder shake method was used for determining foaming ability. 50 ml of the 1% shampoo solution was put into a 250 ml graduated cylinder and covered the cylinder with hand and shaken for 10 times. The total volumes of the foam contents after 1minute shaking were recorded. The foam volume was calculated only. Immediately after shaking the volume of foam at 1-minute intervals for 4 minutes were recorded. [47]

8. PATCH TEST:

In this, the tiny amount of moistened formulation is applied on the surface of the hand and the effects have been observed for irritancy and itchiness caused by formulation.

Table no.4 Patch Test

1.	Swelling	Nil
2.	Redness	Nil
3.	Irritation	Nil

APPLICATION OF ANTI-DANDRUFF HAIR CARE FORMULATION:

The pack or coarse pack should be applied on a weekly basis on hair, as a semi-solid paste in lukewarm water, as it increases the efficiency of the constituents, with required consistency. It should be spread evenly on the hair with the help of a brush, from roots to the hair tip. Then it should be removed by treating with plain water.

NOVELTY OF THE PRODUCT:

- It is consisting with the ingredients which are not used mostly.
- The ingredients are used is alternative to the other herbal extracts with better activity than them.
- Provide best quality of care to the hair and nourish them.
- It provides guaranteed results.
- No use of any artificial ingredients in it.
- Paraben free.
- No harmful effects.

RESULTS AND DISCUSSION:

1. PHYSICAL APPEARANCE/ VISUAL INSPECTION AND ORGANOLEPTIC EVALUATION:

By utilizing sensory organs like eyes or nose, the examination of the formulation is performed under this evaluation, and it includes macroscopic characteristics of the drug or product, such as color, odor, and taste. The texture and appearance are also included under macroscopic features, as elaborated in Table 5. [42].

Table no.5 Organoleptic Evaluation

Sr. No.	Organoleptic Features	Observations			
		F1	F2	F3	Std
1.	Color	Light Brown	Light Brown	Light Brown	Blue
2.	Odor	Lime	Lime	Lime	Mint
3.	Texture	Clear	Clear	Clear	Clear
4.	Appearance	Viscous Clear Liquid	Viscous Clear Liquid	Viscous Clear Liquid	Viscous Clear Liquid

Figure no.15 Organoleptic Evaluation

2. DETERMINATION OF pH:

The pH of herbal shampoo has been shown to be important and enhancing the qualities of hair, minimizing irritation to the eyes, and stabilizing the ecological balance of the scalp. The current trend is to promote herbal shampoo followers. pH is one of the ways to minimize damage to the hair. Mild acidity prevents swelling promote tightening of the scales, there by inducing shine. As seen from below table all the shampoos were acid balanced were ranged 6.1 to 6.4, which were near to the scalp pH. [43].

Table no.6 Determination of pH

Sr. No.	Formulation	pH
01	F1	6.54
02	F2	6.32
03	F3	6.86
04	Std	6.12

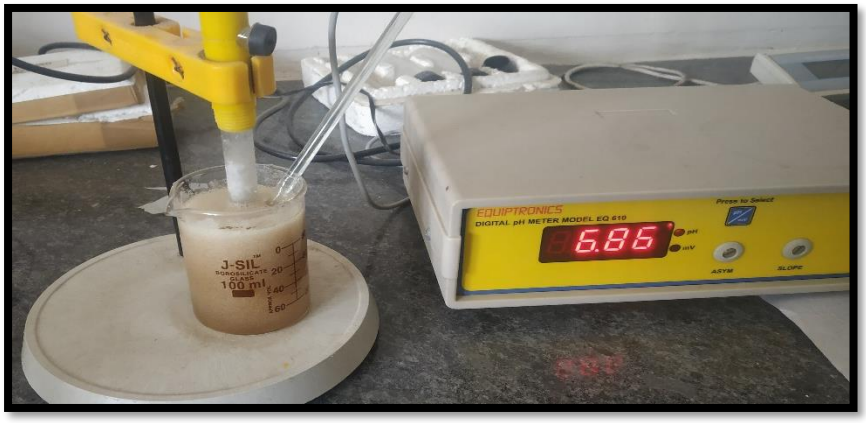

Figure no.16 Determination Of pH

3. CLEANSING ACTION:

The result of detergency ability, when compared with the marketed formulation and it was found between 30-33%. Normally it is considered that forming ability of natural shampoo is not comparable with its synthetic counterpart. This data may prove the ability of natural surfactants like reetha in optimized concentration as the best replacement for the harsh synthetic detergents. The anti-dandruff activity of developed formulation showed positive results. Marketed formulation possesses lower anti-dandruff activity as compared with our formulation. Formulated shampoo (test sample) is more stable than the (control sample) 1, 2, 3 formulations (meera).

Table no.7 Cleansing Action

Sr. No.	Formulation	Cleansing (%)
01	F1	33.16
02	F2	33.0
03	F3	32.89
04	Std	33.21

4. DETERMINE PERCENT OF SOLID CONTENT:

A clean dry evaporating dish was weighed and added 4 grams of shampoo to the evaporating dish. The dish and shampoo were weighed. The exact weight of the shampoo was calculated only and put the evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the shampoo only (solids) after drying was calculated. [44]

Table no.8 Determine Percent of Solid Content

Sr. No.	Formulation	% Of Solid content
01	F1	9.5%
02	F2	8.75 %
03	F3	8.25%
04	Std	3.12%

Figure no.17 Determine Percent of Solid Content

5. SURFACE TENSION MEASUREMENTS:

Was done out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water. The data calculated by following equation given below: where W1 is weight of empty beaker. W2 is weight of beaker with distilled water. W3 is Weight of beaker with shampoo solution. N1 is no. of drops of distilled water. N2 is no. of drops of shampoo solution. R1 is surface tension of distilled water at room temperature. R2 is surface tension of shampoo solution. [45].

$$\mathbf{R2} = \frac{(\mathbf{W3} - \mathbf{W1})}{(\mathbf{W2} - \mathbf{W1})} \times \mathbf{R1}$$

Table no.9 Surface Tension Measurements

Sr. No.	Formulation	Surface Tension (dynes/cm)
01	F1	32.5 ± 2.3
02	F2	31.9 ± 3.2
03	F3	32.7 ± 3.4
04	Std	34.1 ± 2.8

Figure no.18 Surface Tension Measurements by Using Stalagmometer

6. DIRT DISPERSION:

Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy. [46]

Table no.10 Dirt Dispersion

Sr. No.	Formulation	Observation
01	F1	Light
02	F2	Moderate
03	F3	Light
04	Std	Light

Figure no.19 Dirt Dispersion

7. FOAMING ABILITY AND FOAM STABILITY:

Cylinder shake method was used for determining foaming ability. 50 ml of the 1% shampoo solution was put into a 250 ml graduated cylinder and covered the cylinder with hand and shaken for 10 times. The total volumes of the foam contents after 1minute shaking were recorded. The foam volume was calculated only. Immediately after shaking the volume of foam at 1-minute intervals for 4 minutes were recorded. [47]

Table no.11 Foaming Ability and Foam Stability

Sr. No.	No. of Test tubes (ml of stock solution)	Height of foam			
		F1	F2	F3	Std
1.	1 ml	1.9 cm	2.9 cm	3 cm	4.2 cm
2.	2 ml	2 cm	3.3cm	3.5 cm	4.3 cm
3.	3 ml	2 cm	3.3 cm	3 cm	4.6 cm
4.	4 ml	2.3 cm	3.1 cm	3.8 cm	4.6 cm
5.	5 ml	2.5 cm	3.4 cm	4 cm	5 cm

Foaming Index: - F $= \frac{1000}{A}$ where, A= height of the foam

F1 = 500

F2 = 303.03

F3 = 333.33

Standard= 217.391

Figure no.20 Foaming Ability and Foam Stability

8. PATCH TEST:

In this, the tiny amount of moistened formulation is applied on the surface of the hand and the effects have been observed for irritancy and itchiness caused by formulation (Table 11).

Table no.12 Patch Test

Sr. No.	Observation	F1	F2	F3	Std
1.	Swelling	No	No	No	No
2.	Redness	No	No	No	No
3.	Irritation	No	No	No	No

CONCLUSION:

The aim of this study was to formulate a completely polyherbal shampoo which is at par with the synthetic shampoo available in the market. We formulated a polyherbal shampoo by using plant extracts which is used for hair cleansing actions. All the ingredients used to formulate shampoo are safer and greatly reduce the hair loss during combing. Instead of using cationic conditioners we have used Key Lime extract, Sesame extract, Bhringraj Powder, Neem-Tulsi extract and other plant extracts to provide the conditioning effects.
Several tests were performed to evaluate physico-chemical properties of our shampoo. Our prepared shampoo showed comparable result with that of marketed shampoo for quality control tests but further research and development is required to improve it's overall quality.

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