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FORMULATION AND EVALUATION OF HERBAL ANTI DANDRUFF SHAMPOO

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ABSTRACT

This study was aimed to formulate an herbal anti-dandruff shampoo and to assess its physiochemical function that emphasis on safety, efficacy, eliminating harmful synthetic ingredient, and substitute with safe natural ingredients. The herbal shampoo was formulated and evaluated for product performance which includes organoleptic characters, pH, Physicochemical characterization and for solid content. The prepared shampoo was evaluated for the clarity, color, odor, foam producing ability and fluidity. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which may be due to the presence of SLS. It was successfully showing property like anti-hair fall as it contains Fenugreek.

KEYWORDS: herbal, anti-dandruff, shampoo, physiochemical, safety, efficacy, natural ingredients, organoleptic, pH, foam, stability, SLS, fenugreek, irritation, inflammation.

INTRODUCTION

Hairs are the integral part of human beauty. Hair, scientifically known as pili or pilus, constitutes a protein filament growing from follicles located on the dermis or skin. Integral to the integumentary system, it extends into the dermal layer, housed within the hair follicle. Its presence distinguishes mammals as a unique class of organisms. In humans, it serves as a prominent indicator of health, youth, and sometimes social status. Apart from its sensory function, hair offers protection against cold and UV radiation. Any alterations in its growth or

structure can significantly impact one's psychological well-being. In microscopic terms, the diversity in hair length, color, diameter, and cross-sectional shape contributes to the distinct profiles observed with in ethnic groups and among individuals.

ANATOMY OF HAIR

Hair grows from hair follicles situated within the fatty layer of the scalp. Contrary to common belief about individual hair growth, hair follicles grow in clusters known as 'follicular units,' typically comprising 1 to 4 hairs. The hair bulb at the base of each follicle houses the mechanism responsible for hair production. Nourishment for the follicles is supplied by blood vessels within the dermis. Cells within these follicles divide and mature to form the hair shaft. During its initial development beneath the epidermis, the hair maintains a soft texture. As it emerges through the epidermis, the outer layer undergoes a hardening process, forming keratin.

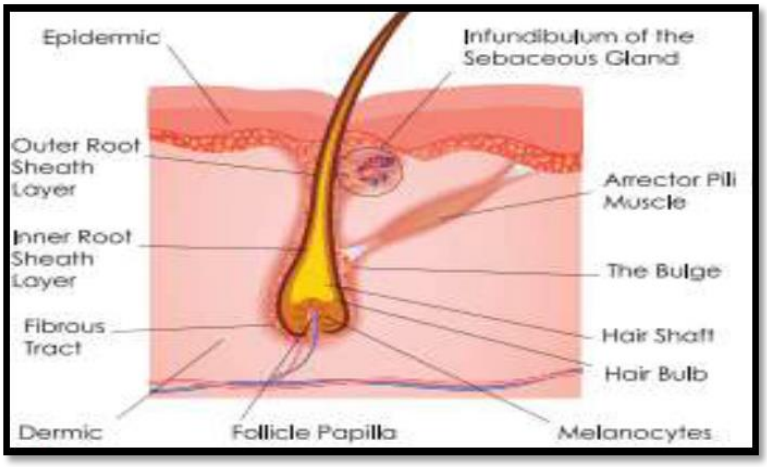

Fig. 1: Hair Anatomy.

Dermal papilla is responsible for regulating the hair cycle and hair growth, and is also comprised of androgen receptors that are sensitive to the presence of DHT.

The matrix, surrounding the dermal papillae, houses all the active cells essential for hair growth and the development of various hair components, including the outer root sheath, inner root sheath, and hair shaft. Together, the matrix and dermal papillae form the hair bulb. The outer root sheath, also called trichelemma, is the keratinized outer layer covering the entire hair follicle within the dermis. It extends through to the epidermis, providing an exit point for the hair to surface. The inner root sheath consists of three parts: the Henle layer, Huxley layer, and cuticle. The Henle's and Huxley's layers form three capsular layers that

interlock to stabilize the hair. The cuticle, closest to the hair shaft, comprises dead, hardened cells, providing additional protection to the hair shaft. The structural cohesion between the capsular layers, such as the Henle's and Huxley's layers, provides stability to the hair, enabling its longitudinal growth. The hair shaft, the visible part emerging from the skin's surface, consists of three layers: the medulla, cortex, and cuticle. The medulla, found in the hair shaft's innermost region, lacks systematic structure and may not always be present. Conversely, the cortex, predominantly composed of structured keratin, imparts strength, durability, and water absorption properties to the hair. Melanin within the cortex dictates hair color based on its distribution, quantity, and types of melanin granules. Serving as the hair's protective outer layer, the cuticle links to the internal root sheath and is a multifaceted structure with a lipid monolayer, aiding in water repellency.

Regarding hair physiology: Anagen, the growth phase, encompasses the majority of actively growing hair, each hair spending several years in this stage. Catagen, a transitional phase lasting a few weeks, witnesses a slowdown in growth as the hair follicle reduces in size. Telogen, the resting phase extending over months, halts hair growth, leading to the detachment of old hair from the follicle, allowing new hair to initiate the growth phase and push out the old hair.

Some common problem related to hair are such as Dandruff, Dry hair, Split ends, Oily hair, Frizzy hair, Limp hair, Hair loss, Heat damage, Color damage, Grey hair, etc.

DANDRUFF

It is a harmless, chronic condition that occurs when the scalp becomes dry or greasy and produces white flakes of dead skin that appear in the hair or on the shoulders. It is a harmless, chronic condition that occurs when the scalp becomes dry or greasy and produces white flakes of dead skin that appear in the hair or on the shoulders. Even though it poses no threat, dandruff can be a source of embarrassment for individuals experiencing it. The scalp consistently generates skin cells, and shedding these dead cells is a regular occurrence. In the case of dandruff, this shedding happens at an accelerated pace. The presence of scalp oil leads to the aggregation of these skin cells, resulting in their clumping and the formation of visible white flakes.

CAUSES OF DANDRUFF

- Dry skin.

- Irritated, oily skin.
- Not shampooing often enough
- Other skin conditions: A. Eczema B. Psoriasis C. Seborrheic dermatitis
- Malassezia-yeast like fungus
- Sensitivity to hair products (contact dermatitis)

TREATMENT

- Follow a healthy diet.
- Avoid stress.
- Shampoo use a combination of special ingredients to control dandruff.

SHAMPOO

A Shampoo is a preparation of a surfactant in a suitable form -liquids, solid or powder-which when used under the specified conditions will Remove surface grease, Dirt and Skin debris From the hair shaft and scalp without adversely affecting the user.

IDEAL PROPERTIES OF SHAMPOO

1. Enhance hair smoothness and shine.
2. Generate a sufficient amount of foam.
3. Be gentle to the scalp, skin, and eyes, avoiding irritation.
4. Thoroughly and efficiently eliminate dirt.
5. Infuse a pleasing scent into the hair.
6. Possess good biodegradability.
7. Exhibit low toxicity levels.
8. Maintain a slightly acidic pH (below 7) to safeguard hair integrity, as a basic environment can weaken the hair by disrupting disulphide bonds in hair keratin.

ACTION OF SHAMPOO

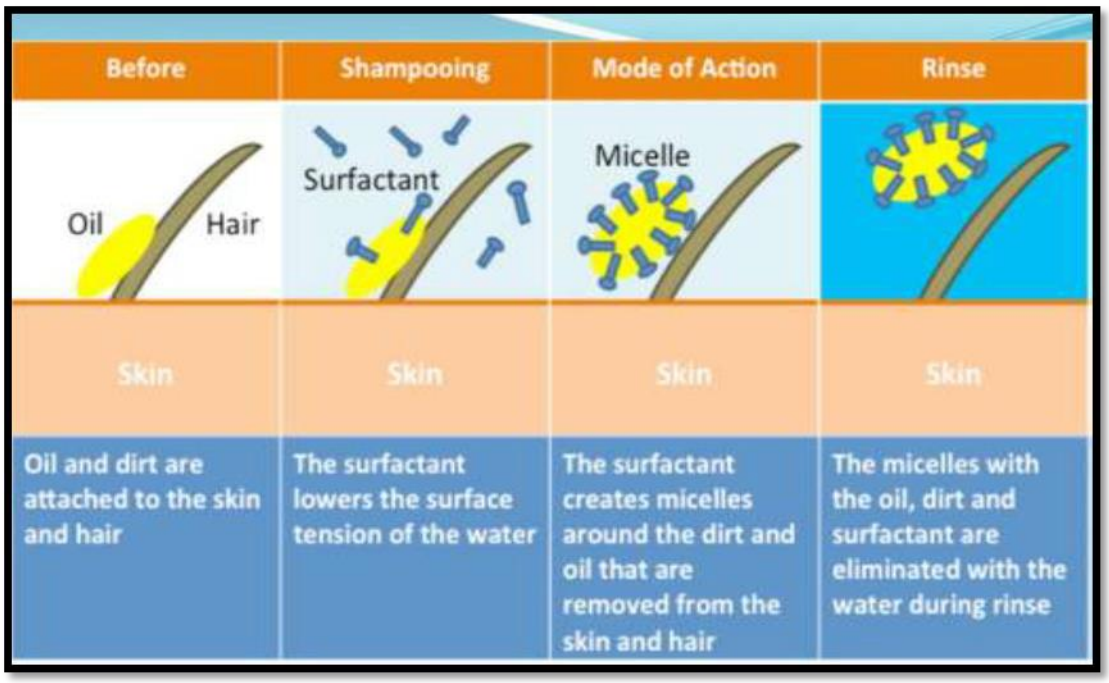

Fig. 2: Mechanism of Shampoo.

HERBAL SHAMPOO

They are the cosmetic preparations that with the use of traditional ayurvedic herbs are meant for cleansing the hair and scalp just like the regular shampoo. They are used for removal of oils, dandruff, dirt, environmental pollution, etc.

ADVANTAGES OF HERBAL SHAMPOO

- Herbal shampoo are made out of pure and organic ingredients and there are no synthetic additives or surfactants are free of any side effects.
- Are bio-degradable and earth friendly
- It doesn't cause irritation to the eyes.
- It is cost friendly, not much expensive.
- Regular usage of herbal shampoo can do wonders for your hair
- By using herbal shampoo, you can get the perfect oil balance.
- They are made out of national essential antiseptic properties that prevent our hair and scalp from the harsh u.v. rays of the sun thus preventing skin infections

FORMULATION OF HERBAL SHAMPOO

Table 1: Composition of Herbal Shampoo Ingredients Quantity.

INGREDIENT	QUANTITY	PURPOSE
Herbal Extract	20ml	Active Ingredient
Glycerine	2ml	Moisturizing agent
NaCl 0.1M	20ml	Buffering agent
SLS	20ml	Foaming agent / Surfactant
Acacia (Gum)	10ml	Viscosity enhancer
Gelatin	q.s.	Thickening agents
Aloe vera gel	2gm	Strength and repairs hair strands
Orange oil	2ml	Preservative
Water	25ml	Vehicle
Indigo Violet	q.s.	Coloring Agent

Preparation of Herbal Shampoo

Formulation of the herbal shampoo was done as per the formula given in Table 1. To enhance the formulation's thickness, a solution containing 7.5% SLS was prepared using 0.1 M NaCl. Then, 20 ml of the herbal extract was gently mixed with 20 ml SLS solution and 20 ml NaCl solution shaking. The final volume was made to 100 ml by adding 10 ml acacia gum extract, 2 ml of glycerine, 2gm of Aloe vera gel and 25 ml of water. To improve Viscosity in the formulation, sufficient quantity (q.s.) of Gelatin was added and heated till it dissolves and it is cooled. The shampoo also contains Indigo violet for colour and 2 ml of Orange oil as preservative.

METHODS

Collection of Plants: The Seeds of plants like Fenugreek and Kalonji were collected from the local market. Curry leaves was obtained from nursery locally. These were washed under running water to remove contaminants. They are dried in sunlight, converted into coarse powders and sieved using 60 meshes. The extracts were prepared by decoction method and the prepared extracts were stored in well-closed containers.

Preparation Of Herbal Extract: 4gm of Curry Leaves powder, 4gm of Fenugreek Powder and 2gm of Kalonji Powder (Table 2) were mixed with 100 ml water in a stainless steel vessel. The mixture was kept for boiling until the water reduced to one quarter. It was then filtered. The clear extract obtained was used as herbal extract.

Table 2: Ingredients of Herbal Extract.

PLANT	PART	QUANTITY FOR 100GM	PURPOSE
Curry leaves	Leaves	4% (4gm)	Prevent hair thinning
Fenugreek	Seed	4% (4gm)	Nourishing the hair follicles
Kalonji	Seed	2% (2gm)	Prevent premature greying

EVALUATION PARAMETERS

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.

1. Physical Appearance

The formulation prepared was evaluated for the clarity, color, odor and foam producing ability and fluidity.

2. Net Content

Mark the bottle upto the Liquid surface. Empty the Bottle, Note down the volume required to filled to the mark.

3. Specific gravity

It is the relative density of the substance to the water.

Determination of specific gravity (d) = w1-w2/ w2- w

Where, w = weight of empty bottle

w1 = weight of empty bottle+ weight of sample

w2 = weight of empty bottle+ weight of water

4. Surface Tension Measurement

In order to determine the surface tension of the shampoo the density of shampoo should be known for that purpose first calculate the density of sample by the formula:

w1= weight of empty bottle

w2 = weight of empty bottle+ weight of water

w3 = weight of empty bottle+ weight of sample

d2 = w3-w1/ w2– w1

To determine surface tension of sample use the following formula

Y2= {d2 × n1 /d1 × n2} Y1

Where, d1 is the density of water

d2 is the density of sample

Y1 is the surface tension of water

Y2 is the surface tension of sample

n1 is the number of drops of water

n2 is the number of drops of sample

5. Foaming ability and stability

Cylinder shake method was used for determining foaming ability. 50ml of the 1% herbal shampoo solution was put into a 250ml graduated cylinder & the cylinder was covered with hands and shaken for 10 minutes. The total volume of the foam content after 1 minute shaking was recorded. Immediately after shaking the volume of foam at 1 minute intervals for 10 minutes were recorded. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which may be due to the presence of SLS.

6. Skin Irritation Test

Prepared herbal shampoo was applied on skin for 5 minutes after that was washed and tested for irritation or inflammation to the skin.

7. Stability Study

The stability of the formulation was studied for a period of four weeks by keeping at temperature of 25-30°C.

8. Dirt dispersion

Two drops of herbal shampoo were added in a wide mouthed falcon tube containing 10ml of distilled water. A single drop of India ink was introduced into the falcon tube, which was then covered and shaken ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy.

9. Microbial examination

100 micro litre of shampoo was mixed with melted Mueller Hinton agar and poured to sterile petri dishes under aseptic conditions. The plates were rotated to mix thoroughly and then allowed to set. The plates were placed in an incubator set at 37°C for 24 hours, after which they were examined for any signs of microbial growth.

RESULT AND DISSCUSSION

1. Physical Appearance

Test	Result
Colour	Peacock green
Odour	Pleasant smell
Clarity	Clear
Foam ability	Yes

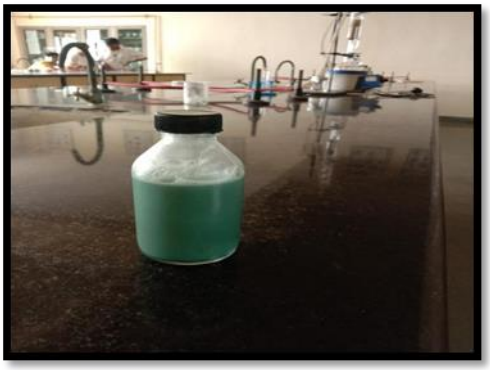

Fig. 3: Appearance of Shampoo.

2. Net Content

The Net Content was found to be 95ml.

3. Specific gravity

It is the relative density of the substance to the water.

Determination of specific gravity (d) = w1-w2/ w2- w

Where, w = weight of empty bottle

w1 = weight of empty bottle+ weight of sample

w2 = weight of empty bottle+ weight of water

Using this formula the specific gravity of shampoo can be determined.

Put the value of w =14.80 gm

w1= 24.43 gm

w2= 22.962 gm

d = 24.93-22.962 / 22.962-14.80 = 0.21 gm

The Specific gravity of Shampoo was found to be 0.21gm.

4. Surface Tension Measurement

In order to determine the surface tension of the shampoo the density of shampoo should be known for that purpose first calculate the density of sample by the formula:

w1= weight of empty bottle (14.80gm)

w2 = weight of empty bottle+ weight of water (22.96 gm)

w3 = weight of empty bottle+ weight of sample (24.43 gm)

d2 = w3-w1/ w2– w1 = 24.43-14.80 /22.96 – 14.80

= 9.63/8.162

= 1.17 gm/ml

Solution	No. of drop count (1)	No. of drop count (2)	Average No. of drop count	Density (gm/ml)	Surface Tension (dyne/ cm)
Water	25	25	25	1 gm/ml	72dyne/cm
Shampoo Solution	65	62	63.5	1.3gm/ml	36.85 dyne/ cm

Y2= {d2 × n1 /d1 × n2} Y1

Where, d1 is the density of water (1g/ml)

d2 is the density of sample (1.3 g/ml)

Y1 is the surface tension of water (72 dyne / cm)

Y2 is the surface tension of sample (?)

n1 is the number of drops of water (25)

n2 is the number of drops of sample (63.5)

Y2= {1.3 × 25/ 0.992 × 63.5} 72

= 32.5/ 63.5 × 72

= 36.85 dyne/cm

The surface tension of the sample was found to be 36.85 dyne/ cm

5. Foaming ability and stability

Cylinder shake method was used for determining foaming ability. 50ml of the 1% herbal shampoo solution was put into a 250ml graduated cylinder & the cylinder was covered with hands and shaken for 10 minutes. The total volume of the foam content after 1 minute shaking was recorded. Immediately after shaking the volume of foam at 1 minute intervals for 10 minutes were recorded. The foam volume remains same throughout the period of about 5 min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which may be due to the presence of SLS.

The foaming ability and stability of shampoo was studied and observed.

6. Skin Irritation Test

Prepared herbal shampoo was applied on skin for 5 minutes after that was washed and tested for irritation or inflammation to the skin.

No irritation or inflammation is observed.

7. Stability Study

The stability of the formulation was studied for a period of four weeks by keeping at temperature of 25-30°C.

After keeping at certain temperature for four weeks it is observed that the Formulated shampoo is Stable.

8. Dirt dispersion

Two drops of herbal shampoo were added in a wide mouthed falcon tube containing 10ml of distilled water. 1 drop of India ink was added, the falcon tube was covered and shaken for ten times. The results indicated that few particle of ink retained in foam, so that the prepared formulation estimated was light.

9. Microbial examination

100 micro litre of shampoo was mixed with melted Mueller Hinton agar and poured to sterile petri dishes under aseptic conditions. The plates were rotated to mix thoroughly and then allowed to set. The plates were incubated at 37°C for 24 hours and observed for microbial growth.

CONCLUSION

The Herbal shampoo was prepared by using the Ingredients listed in the report after preparing the shampoo it was evaluated using the evaluation tests such as Physical test which includes colour, odour, pH also other test include Surface tension, Specific gravity, Dirt dispersion, Anti microbial, Stability study, Net content, etc. required for the shampoo to show it's property. This Shampoo was successfully showing property like anti-hair fall as it contains Fenugreek. It also prevents premature greying as it consists of black cumin.

Here it has been used oldest and effective type of drug that is Fenugreek and Black Cumin for the treatment of problem. Here the main focus is on treatment of Hair fall and other hair related issues by evaluating all the parameters we could say that the product is capable of giving the results as required.

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