

HERBAL SHAMPOO- A REVIEW

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ABSTRACT

Shampoos are the cosmetics preparations meant for cleansing the hair by removal of the dirt grease from the hair shaft and scalp. The aim of the present investigation was to formulate and evaluate herbal shampoo containing natural ingredients with an emphasis on safety and efficacy, which will avoid the risk posed by chemical ingredients. There are wide range of Synthetic Shampoos available in the market. Various drugs are used for the pre mixture of cosmetics Shampoo. Such drugs shows different side effects such as hair loss, high scaling, Scratching, discomfort, nausea and headache. The main objective of this study was to eliminate harmful synthetic ingredient from shampoo formulation and substitute them with safe natural ingredients. It clears sebum, dirt, dandruff, promotes hair growth, strengthens, and darkens the hair. Moreover, it also acts as a conditioning agent and performs all these actions without affecting or damaging hair. By using herbal natural extracts of Hibiscus Rosasinensis (Hibiscus), Ocimum Sanctum (Tulsi), Azadirachta Indica (Neem), Murraya koenigii (Curry Leaves), Sapindus Mukorossi (Reetha), Acacia Concinna (Shikakkai), Trigonella Foenum Graecum (Fenugreek Seeds), Aloe Barbadensis Miller (Aloevera), Flaxseed, Rice water we can reduce the side effects of Synthetic Shampoo. By using herbal natural extracts we can reduce the side effects of shampoo and Herbal shampoo is safer than synthetic shampoo.

1. INTRODUCTION

Hairs are the characteristic covering of mammalian skin. Which is originated from embryonic ectoderm. The main function of the hair is facet of appearance in human. There is loss of hairs from an area of body is called as alopecia or baldness. Millions of people facing the problem regarding hair loss, over 40 % of men over the age of 30 and a significant number of women also affects Hair loss.^[1] The various factors are affecting on the hair loss problems in which main factors are responsible for hair loss are scarring, disease, infection, less blood circulation in the blood capillaries of scalp and sensitivity to the androgen. Although alopecia requires a careful history. Need to close attention to the appearance of the hair loss and a few simple studies can quickly narrow the potential diagnosis.^[2] The mechanism of action of herbal drug in preventing the hair loss or hair growth promotion is outlined as well. Now a day's peoples are conscious about hairs due to increase in pollution hairs get damaged. Pollutants badly effects on hair resulted into spilt ends, roughness, retarded growth of hairs, loss of shine of hair and hair falls.^[3,4]

HAIR PROBLEMS

- **HAIR LOSS:** The main reason behind the hair loss is Stress, medication, changes in hormone and many hair styling products can contribute to hair loss.

- **OILY HAIR/GREASY HAIR:** Oily hair is caused by excessive production of natural oil (sebum) by the scalp. Sebum is produced by sebaceous glands which sometimes "work overtime" leading to excessive amount of oil.
- **DANDRUFF:** Dandruff is a non-inflammatory harmless skin condition that affects scalp and might result in hair loss. It is scaly and adheres to the root of the hair.
- **DRY HAIR:** Dry hair occurs due to deficiency of proteins in the diet. Menopause, anemia, hormonal imbalance, birth control pill can also lead to dry hair.
- **SPLIT ENDS:** Splits ends occur when the hair ends dry and other reasons are exposure to extreme weather conditions. Hair care techniques such as straightening and curling and chemical hair products may cause spilt ends.

These all problems of hair are covered by shampoo but in case of synthetic shampoos they are made from chemical constituents shows side effects on hairs. Shampoos are the cosmetics preparations meant for cleansing the hair by removal of the dirt grease from the hair shaft and scalp. There are wide range of synthetic shampoos available in the market with different functions. But these synthetic shampoo shows harmful effect on the hair and scalp like dryness of hair and keratin loss. In synthetic shampoos, surfactants

(synthetic) are added mainly for their cleansing and foaming property, but the continuous use of these surfactants leads to serious effects such as eye irritation, scalp irritation, loss of hair, and dryness of hairs.^[7] Due to these reasons herbal shampoos has evolved as an alternative to synthetic shampoo because of the safe and traditionally used ingredients. Herbal shampoo is a cosmetic preparation which uses herbs and meant for cleansing the hair and scalp just like regular shampoo. Many of the herbs are reported to have beneficial affect on hair and are used in herbal shampoos. Objectives are to formulate the herbal shampoo, to evaluate the herbal shampoo, the part used for formulation is leaves, fruits and root, to reduce side effects of chemical formulation, to improve hairs texture, to darkening the hair color.

This study was designed to formulate an herbal shampoo and to evaluate and compare its physicochemical properties with the marketed synthetic and herbal shampoo in search of a safe and effective cosmetic product. Hair is an important part of overall appeal of human body. There are many hair problems like thinning of hair, lack of hair volume, immature greying, conditioning, hair loss etc. have been observed by most of the individuals.

1.1 Hair and Hair Growth Cycle

Hair is a filamentous biomaterial, which grows approximately 0.3 mm/day or 6 inches per year, while the scalp sheds 100 hairs per day. Dermal follicles are the source of hair, a filamentous biomaterial. One of the features that distinguish the mammalian class is hair, which is only seen in mammals. Often, the term "hair" describes two different structures: 1) the area under the skin, known as the hair follicle, or the bulb when it is removed from the skin. This organ is located in the dermis and maintains stem cells, which promote regrowth of hair after fall or wound.^[8] and 2) the hard

filamentous part that extends above the skin surface is called shaft. Hair growth is the cumulative, physical consequence of coordinated process of cellular proliferation and differentiation within a hair follicle. The stem cells, which commit to the fate of a hair follicle, enter a period of massive proliferation that results in the formation of mature hair follicle. Hair follicles are primarily composed of epithelial and dermal components. The main constituents of hair follicles are dermal and epithelial cells. The hair cycle refers to the regular cycles of regeneration that hair follicles, which are mini-organs that produce the hair shaft, exhibit.^[9,10] The hair follicle, undergoes successive cyclic periods of growth, in which previous hair is shed then an active growing phase is called (anagen), a small transitional regressive phase (catagen) and a dormant resting phase (telogen)^[11] which allows the follicle to produce different types of hair in response to hormonal changes. Each strand of hair on the human body is at its own stage of development. Once the cycle is complete, it restarts and a new strand of hair begins to form. The growth or anagen phase of human scalp hair lasts 2-7 years during which the hair follicle actively produces precursor cells that differentiate into different types of hair cells. Catagen which lasts for several weeks, is the stage during which production of precursor cells ceases and the hair bulb rapidly involutes the final phase is called telogen phase which is the resting phase of the hair cycle which lasts for an average of 3 month.^[12] Ten to fifteen percent of the hair follicles on one's head are in this phase of growth at any given time. Three months later, these hairs begin to fall. The anagen phase begins again once the telogen phase is complete. The preceding hair strand is pushed up and out by the new, growing strand. Most common interest in hair is focused on hair growth, hair types and hair care, but hair is also an important biomaterial primarily composed of protein, notably keratin.



Fig. No. 1.1.

Table 1.1: Type of Hairs.

Hair type	Characteristics
Lanugo	< 30 µm diameter; >2 mm length
Vellus	< 30 µm diameter; <2 mm length
Intermediate	>30 µm diameter; <60 µm diameter; >2 mm length
Terminal	>60 µm diameter; >2 mm length

Table 1.2: Rate of terminal hair growth in adults (Approximately).

Location	Typical hair growth per day (mm)
Chin	0.38
Scalp	0.35
Axilla	0.30
Eyebrow	0.20
Thigh	0.16

Table 1.3: Estimated number of hair follicles in the skin by body region.

Location	Numbers of follicles
Head	1,000,000
Trunk	425,000
Arms	220,000
Legs	370,000
Approximate total	2,000,000

Table 1.4: Hair cycle duration with body location.

Sr. No.	Location	Hair growth state	Typical Time Duration
1.	Scalp	Anagen	2-6 years
		Catagen	2-3 weeks
		Telogen	3 months
2.	Beard	Anagen	4-14 weeks
		Telogen	10-18 weeks
3.	Arms	Anagen	6-12 weeks
		Telogen	7-13 weeks
4.	Legs	Anagen	19-26 weeks
		Telogen	13-34 weeks

❖ **CAUSES OF HAIR LOSS**

There are many factors associated with hair loss (Alopecia), but overall causes for hair loss are attributed to male hormones (Androgens), genetic factors and age. The causing factors for hair loss are listed below.

- Reduction in hair follicle function due to male hormones
- Reduction in metabolic functions of hair follicles and hair bulbs
- Reduction in scalp physiological functions
- Local impairment of the circulation due to tension in the scalp



Fig. No. 1.2

1.2 Disorders of Hair

The main problems associated with hairs are pigmentation (fading), dandruff and falling of hairs (shedding) and balding.^[13] (Fig.1.2). There are various disorders of hair, which causes the hair loss (Table 1.5). The term androgenetic alopecia is often used to describe the patterned loss of scalp hair in genetically susceptible men and women. This condition is also known as male pattern hair loss or common baldness in men and as female pattern hair loss in women. Alopecia in these cases is characterized by thinning of hair as opposed to follicular loss, at least in early stages.^[14] In androgenetic alopecia, shortening of the anagen phase and continuous miniaturization of sensitive hair follicles takes place that result into conversion of thin terminal hairs into fine vellus hairs. The 5-reductase type-2 enzyme plays a

central role by intra-follicular conversion of testosterone to di-hydrotestosterone.^[15] Some degree of follicular miniaturization and consequential hair loss is universal and is considered a physiological secondary sexual characteristic. Androgenetic alopecia only becomes a medical problem when the hair loss is excessive, premature and distressing to the patient. A number of medical treatments aimed at arresting the progression of the hair loss have become available in recent years, and surgical treatments are constantly being refined predisposition, hormonal factors, and disease states such as typhoid, malaria, jaundice and use of chemotherapeutic agents. It is a dermatologic disorder, and the surge for discovering natural products with hair growth promoting potential is continuous.^[16]

Table 1.5: Common disorder of Hair.

Disease	Etiology	Clinical Features	Treatment
Anagen effluvium	Secondary to cytotoxic drugs like thallium, bismuth, arsenic, Cell division inhibition in hair follicle.	Loss of all hair on scalp	Scalp cooling
Telogen effluvium	Shedding of telogen hairs (no scars), Secondary to Stress like high fever, surgery, crash diet	Uniform decrease in density all over scalp, Positive hair pull test	Shampoo less frequently. Can get up to years to grow back
Alopecia Areata	Genetic Factor, Autoimmune disease	Circular patches of hair loss, Hairs grow back white.	Inject steroid (kenalog)
Traction alopecia	Hair styling like Pony tails.		Hair grafts
Androgenic Alopecia	Male and female pattern baldness	Beginning with bitemporal recession, bald patch	Rogaine (Minoxidil), Propecia (Finasteride), Transplants
Trichotillomania	Pulling hair out	Chronic, repetitive hairpulling	Self-monitoring, Stimulus control, Habit-reversal training

1.3 Shampoos are of the following types

- Powder Shampoo
- Liquid Shampoo
- Lotion Shampoo
- Cream Shampoo
- Jelly Shampoo
- Aerosol Shampoo
- Specialized Shampoo
- Conditioning Shampoo
- Anti- dandruff Shampoo
- Traditional shampoo
- Herbal shampoo
- Solid shampoo

1.4 Functions of Shampoo

- It must remove dirt or soil thoroughly and effectively.
- It should thoroughly clean the hair.
- It should generate enough foam to please the user.
- Rinsing with water should easily remove it.
- It should leave the hair with a lovely scent.
- It should have no negative side effects or cause skin and eye discomfort

1.5 The ideal characteristic of herbal shampoo

A healthy shine but when in large amounts it makes the hair look dirty.

- Should effectively and completely remove the dust, and excessive sebum.
- Should effectively wash hair.
- Should produce a good amount of foam
- The shampoo should be easily removed by rinsing with water.
- Should leave the hair non-dry, soft, and lustrous with good, manageability.
- Should impart a pleasant fragrance to the hair.
- Should not make the hand rough and chapped.
- Should not have any side effects or irritate skin or eye

2. HERBS COMMONLY USED IN HERBAL SHAMPOO

<p>Green tea</p> 	<ul style="list-style-type: none"> • Biological Source – It consist of dried leaves of plant <i>Camellia sinensis</i> L. • Family- Theaceae • Chemical Constituents – Catechin, Epicatechin, Gallic acid, Epigallocatechin, Epigallocatechin Gallate, Epigallocatechin Gallate and (+)-Gallic acid, Phenols, Alkaloids-Caffeine, Methylxanthine, Lignin Carotenoids, • Uses – <ol style="list-style-type: none"> 1. Boost hair colour 2. Prevents hair fall 3. Treat dandruff
<p>Neem</p> 	<ul style="list-style-type: none"> • Synonym – Kadunimb, Margosa • Biological Source – Fresh leaves or dried leaves powder of plant <i>Azadirachta indica</i>, • Family- Meliaceae. • Chemical Constituents – Simasterol, not less than 1% w/w of Rutin • Uses - <ol style="list-style-type: none"> 1. Cures dandruff. 2. Relives drying and itching. 3. Antilice property. 4. Prevents hair loss.
<p>Onion Seeds</p> 	<ul style="list-style-type: none"> • Synonym – Black cumin, nigella seeds, kalonji • Biological Source – Derived from the plant <i>Allium Cepa</i> L. • Family - Liliaceae. • Chemical Constituents – Proteins (albumin), Allyl Propyl Disulphide, Diallyl Sulphide, Allin, Allicin, Minerals, Potassium, Zinc, Calcium, Magnesium. • Uses – <ol style="list-style-type: none"> 1. Antibacterial property 1. Fight hair lice, removes dandruff, 2. Promotes hair growth and reduces hair fall
<p>Curry Leaves</p> 	<ul style="list-style-type: none"> • Synonym – Sweet neem leaves • Biological Source – It consist of dried leaves of plant <i>Murraya koingii</i> • Family - Rutaceae. • Chemical Constituents – Vitamins – C, B, E, Proteins, antioxidants . • Uses – <ol style="list-style-type: none"> 1. Straighten the hair roots , treat dandruff 2. Darkens the hair colour and promotes hair growth
<p>Tulsi leaves</p>	

	<ul style="list-style-type: none"> • Synonym – Sacred basil, Holy Basil. • Biological Source – Tulsi Consist of fresh and dried leaves of <i>Ocimum Sanctum</i> Linn.(Syn. <i>Ocimum tenuiflorum</i>) • Family- Lamiaceae • Chemical Constituents – volatile oil, 70 % eugenol, carvacrol and eugenol- methyl –ether, caryophyllin • Uses – <ol style="list-style-type: none"> 1. Helps to maintain moisture in scalp. 2. Improve blood circulation. 3. Treating premature graying of hairs. 4. Reduce the hair fall. 5. It shows antibacterial activity
Hibiscus Flowers	
	<ul style="list-style-type: none"> • Synonym – Jaswand, shoe flower • Biological Source – It consist of flowers of plant <i>Hibiscus rosa sinensis</i> • Family – Malvaceae • Chemical Constituents – Vitamins, quercetin-3-diglucoside, kaemferol-3- xylosylglucoside, 5-diglucoside, beta-sitosterol, iron, beta carotene, calcium, tannin, flavonides, saponins • Uses – <ol style="list-style-type: none"> 1. Stimulates hair growth. 2. Prevent premature greying.
Aloe vera	
	<ul style="list-style-type: none"> • Synonym – Aloe , Musabber , Kumari. • Biological Source – Aloes is the dried juice of the leaves of <i>Aloe Barbadosis</i> Miller • Family- Liliaceae. • Chemical Constituents – anthraquinone glycosides, aloin • Uses – <ol style="list-style-type: none"> 1. Deep clean oily hairs. 2. Strengthens and repairs hair strands. 3. Promote hair growth. 4. Make hair smooth and silky
Shikekai	
	<ul style="list-style-type: none"> • Synonym – Vimala, bhuriphena • Biological Source – It consist of dried fruits of plant <i>Acacia concinna</i>, family Fabaceae • Chemical Constituents – Citric acid, tartaric acid, lactose Uses – <ol style="list-style-type: none"> 1. Prevents split ends 2. Crubs hair loss
Reetha	
	<ul style="list-style-type: none"> • Synonym – - Soap nut, Aritha • Biological Source – It consist of the dried as well as fresh fruits of the species <i>Sapindus mukorossi</i> • Family - Sapindaceae • Chemical Constituents – triterpenoid saponins named Sapindoside A&B. Fruits also contain sesquiterpenoidal glycosides and six different fatty ester of tetracyclic triterpenoids. • Uses – <ol style="list-style-type: none"> 1. Cleanses the skin of oily secretion and is even used as a cleanser for washing hair
Lemon juice	

	<ul style="list-style-type: none"> • Synonym –Limonis Fructus, Limonis Cortex • Biological Source – Lemon is the fruit of Citrus limon (L.) Burm., a small tree • Family- Rutaceae. • Chemical Constituents – , ascorbic acid, carbohydrates, Fat , zinc, calcium, potassium, magnesium, iron, phosphorus, protein, riboflavin, thiamine, pantothenic acid (B5) • Uses – Shampoos often include citric fruits, like lemon, for their fragrant smell and ability to adjust the scalp to a 5.5 pH. This helps to: maintain neutrality. prevent any adverse reactions and inflammation on the skin.
<p>Rice water</p>	
	<ul style="list-style-type: none"> • Synonym – Rice • Biological Source – It consists of embryo and endosperm of the seeds of Oryza sativa • Family-Graminae/ Poaceae • Chemical Constituents – The rice grain constitutes 12% water, 75–80% starch (carbohydrate), 7% protein, 3% fat and 3% fibres. • Uses – <ol style="list-style-type: none"> 1. Promotes hair growth. 2. Helps to remove dandruff. 3. Gives shine and luster to the hairs.
<p>Fenugreek seeds</p>	
	<ul style="list-style-type: none"> • Synonym – Methi • Biological Source – Ripe dried seeds of Cultivated plants Trigonella Foenum – graecum Linn • Family- Fabaceae. • Chemical Constituents – 3.0% of mucilages, 5.0% Fixed Oil, Steroidal Saponins 0.5-1.5% and 20% of proteins, diosgenin, yamogenin, smilagenin and sarsapogenin. Flavonoids, • Uses – <ol style="list-style-type: none"> 1. Fight dandruff 2. Prevent premature graying of hairs. 3. Control scalp inflammation. 4. Adds shine and soft texture.
<p>Flax Seed</p>	
	<ul style="list-style-type: none"> • Synonym – L. crepitans (Boenn.) Dumort. • Biological Source – • Family- Linaceae • Chemical Constituents - Triterpenoids, Steroids, Glycosides, Saponins, Alkaloids, Flavonoids, Tannins, Proteins, Free amino acids, Carbohydrate and Vitamin C. • Uses – Anti-allergic, Antioxidant and Anti-inflammatory activities

3. MATERIALS AND METHODS

3.1 Collection of plant materials

The Materials used in the present study are Flowers of Hibiscus Rosasinensis (Hibiscus), Ocimum Sanctum (Tulsi), Azadirachta Indica (Neem), Murraya koenigii (Curry Leaves), Sapindus Mukorossi (Reetha), Acacia Concinna (Shikakkai), Trigonella Foenum Graecum (Fenugreek Seeds) and Aloe Barbadensis Miller (Aloe vera) were collected from Nearby Areas. The herbal shampoo was formulated using the following

natural ingredients were collected from the college medicinal garden and were properly authenticated in the Department of Pharmacognosy.

- **Drying:** All the ingredients required for shampoo preparation were shade dried for 5 days.
- **Size Reduction:** Dried materials are subjected to size reduction by using hand driven mixer.
- **Sieving:** Pass the powdered material through the sieve number 80 to get uniform particle size.

3.2 Preparation of Extracts

About 100 g of each powdered plant materials, namely Flowers of Hibiscus Rosasinensis (Hibiscus), Ocimum Sanctum (Tulsi), Azadirachta Indica (Neem), Murraya koenigii (Curry Leaves), Sapindus Mukorossi (Reetha), Acacia Concinna (Shikakkai), Trigonella Foenum Graecum (Fenugreek Seeds), and Aloe Barbadensis Miller (Aloevera) were homogenized. The powdered material was extracted with distilled water by boiling for 4 h. The extract of each plant material was separated and evaporated. Shown in table no.3.1.

- **Preparation of Flaxseed solution**

Add the flaxseeds to the sufficient quantity of water. Boil this water for around 10 minutes and keep stirring to avoid the flaxseeds from sticking to the base of the

utensil. Turn the stove off when you achieve a gel-like texture, not too dense but not too thin. Let the gel cool down for about an hour while it thickens. Put the sock in a glass measuring cup, and then empty the gel into it. Now, squeeze the gel from the stock into the measuring cup in order to strain it.

- **Preparation of Rice Water**

Taken a cup of rice in a clean bowl and rinsed with water for once to remove the dirt and impurities. Drained the water and again added some amount of water to rice and covered the bowl with heavy lid. Kept the bowl aside at room temperature for a day. Later, collected the rice water and transferred into a clean glass jar and allowed it to ferment for 2 to 3 days.

Table 3.1: Preparation of Extract.

Sr. No.	Drug Name	Part	Quantity for 100 gm
1	Green tea	Leaves	06%
2	Neem	Leaves	09%
3	Onion Seeds	Seed	06%
4	Curry Leaves	Leaves	06%
5	Tulsi Leaves	Leaves	06%
6	Hibiscus Flowers	Flowers	12%
7	Aloe vera	Leaves	07%
8	Shikekai	Pods	22%
9	Reetha	Nut	20%
10	Fenugreek seeds	Seed	06%

3.3 FORMULATION OF HERBAL SHAMPOO

Formulation of the herbal shampoo was done as per the formula given in Table 1. To the Gelatin (10%), added the herbal extract and mixed by shaking continuously at

the time interval of 20 min. 1 ml of lemon juice was also added with constant stirring. To improve aroma in the formulation, sufficient quantity of essential oil (rose oil) added and made up the volume to 100 ml with Gelatin.

Table 3.1: Formulation of Herbal Shampoo.

Sr. No.	Material Required	Quantity	Medicinal Use
1	Green tea Extract	0.5 g	Antidandruff
2	Neem Extract	0.5 g	Antibacterial
3	Onion seeds Extract	0.5 g	Antibacterial
4	Curry Leaves Extract	0.5 g	Antifungal
5	Tulsi Leaves Extract	0.5 g	Antifungal, Antioxidant
6	Hibiscus Flowers Extract	0.5 g	Conditioning
7	Aloe vera	0.5 g	Moisturizing
8	Shikekai Extract	0.5 g	Detergent
9	Reetha Extract	0.5 g	Foaming
10	Fenugreek seeds Extract	0.5 g	Anti-fungal and Anti-inflammatory
11	Lemon Juice	q.s	Antimicrobial
12	Gelatin	q.s	Gelling agent
13	Rice Water	q.s	Antioxidant
14	Flax Seed	q.s	Conditioning
15	Rose Oil	q.s	Fragrance

3.4 Evaluation of Herbal Shampoo

- **Physical appearance/visual inspection**

The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity.

- **Determination of pH**

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

- **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 was 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.

- **Wetting time**

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

- **Rheological evaluations**

The viscosity of the shampoos was determined by using Brookfield Viscometer (Model DV-1 Plus, LV, USA) set at different spindle speeds from 0.3 to 10 rpm. The viscosity of the shampoos was measured by using spindle T95. The temperature and sample container's size was kept constants during the study.

- **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.

- **Cleaning action**

5 grams of wool yarn were placed in grease, after that it was placed in 200 ml. of water containing 1 gram of shampoo in a flask. Temperature of 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 sample was taken out, dried and weighed. The amount of grease removed was calculated.

- **Surface tension measurement**

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chromic acid and purified water. Because surface tension is highly affected with grease or other lubricants.

- **Detergency ability**

The Thompson method was used to evaluate the detergency ability of the samples. Briefly, a crumple of hair were washed with a 5% sodium lauryl sulfate (SLS) solution, then dried and divided into 3g weight groups. The samples were suspended in a n-hexane solution containing 10% artificial sebum and the mixture was shaken for 15 minutes at room temperature. Then samples were removed, the solvent was evaporated at room temperature and their sebum content determined. In the next step, each sample was divided into two equal parts, one washed with 0.1 ml of the 10% test shampoo and the other considered as the negative control. After

drying, the resided sebum on samples was extracted with 20 ml n-hexane and re-weighed. Finally, the percentage of detergency power was calculated.

- **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 1 minute 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.

- **Skin sensitization test**

The guinea pigs were divided into 7 groups (n=3). On the previous day of the experiment, the hairs on the backside area of guinea pigs were removed. Shampoos were applied onto nude skin of animals of groups. A 0.8% v/v aqueous solution of formalin was applied as a standard irritant on animal. The animals were applied with new patch/formalin solution up to 72 hours and finally the application sites were graded according to a visual scoring scale, always by the same investigator. The erythema scale was as follows: 0, none; 1, slight; 2, well defined; 3, moderate; and 4, scar formation (severe).

- **Eye irritation test**

Animals (albino rats) were collected from animal house. About 1% shampoo solutions was dripped into the eyes of six albino rabbits with their eyes held open with clips at the lid. The progressive damage to the rabbit's eyes was recorded at specific intervals over an average period of 4 seconds. Reactions to the irritants can include swelling of the eyelid, inflammation of the iris, ulceration, hemorrhaging (bleeding) and blindness.

- **Surface characterization**

Surface morphology of the hairs was examined by scanning electron microscopy (Leo 430, Leo Electron Microscopy Ltd., Cambridge, England). The hair samples were mounted directly on the SEM sample stub, using double side stitching tape and coated with gold film (thickness 200nm) under reduced pressure (0.001 mm of Hg). The photomicrographs of suitable magnification were obtained for surface characterization.

- **Stability studies**

The thermal stability of formulations was studied by placing in glass tubes and they were placed in a humidity chamber at 45°C and 75% relative humidity. Their appearance and physical stability were inspected for a period of 3 months at interval of one month.

- **Evaluation of herbal powder shampoo Solubility**

Solubility is defined as the ability of the substance to 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 filter it, the residue obtained is weighed and noted.

Loss on drying

Loss on drying is the loss of mass expressed in percent m/m. Two gram of the powder was weighed accurately and transferred into a dry Petri dish. The Petri dish is placed in a dessicator for 2 days over calcium chloride crystals. Then the powder was taken and weighed accurately to find out the weight loss during drying.

Swelling index

The swelling index is the volume in milliliters occupied by one gram of a drug, including any adhering mucilage, after it has swollen in an aqueous liquid for 4 hour. Accurately weighed 1 g of the powder and transferred it into glass stopper measuring cylinder containing 25 ml of water. Then it is shaken thoroughly at every 10 minutes for 1 hour. After that it was kept for 3 hours at room temperature. The volume was measured in ml.

Angle of repose

It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow.

Methods

- i. Funnel method.
- ii. Open – ended cylinder method.

I Funnel method:

Required quality of dried powder is taken in a funnel placed at a height of 6 cm from a horizontal base. The powder was allowed to flow to form a heap over the paper on the horizontal plane. The height and radius of the powder was noted and recorded.

II Open - ended cylinder method:

Required amount of dried powder is placed in a cylindrical tube open at both ends is placed on a horizontal surface. Then the funnel should be raised to form a heap. The height and radius of the heap is noted and recorded.

Bulk density

Bulk Density is the ratio between the given mass of a powder and its bulk volume. Required amount of the powder is dried and filled in a 50 ml measuring cylinder up to 50 ml mark. Then the cylinder is dropped onto a hard wood surface from a height of 1 inch at 2second intervals. The volume of the powder is measured. Then the powder is weighed. This is repeated to get average values.

Foaming index

One gram of the powder was weighed accurately and transferred into 250 ml conical flask containing 100 ml of boiling water. Then it is warmed gently for 30 minutes, cooled and filtered and make up the volume to 100 ml in standard volumetric flask. This extract is taken in 10 test tubes in a series of successive portion of 1, 2, 3....10 ml and remaining volume is made up with water to 10 ml. 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.^[3-11]

4. CONCLUSION

The present study was point out with the object of preparing the herbal shampoo that reduces hair loss, promote growth and strength of hair. The main purpose behind this formulation was to develop a stable and effective shampoo by including all types of additives which are added in this formulation. By using herbal natural extracts we can reduce the side effects of shampoo. Herbal shampoo is more Safer than synthetic shampoo. Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally. To provide the effective conditioning effects, the present study involves the Use of shikakai, Flax Seed and other plant extracts instead of synthetic which gives Antidandruff, Antibacterial, Antioxidant, Antifungal properties. There is a strong need to change the consumer perception of a good shampoo and the onus lies with formulators. Hence the formulated herbal shampoo was safe and effective for use and helps in reducing the hair fall.

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