



A REVIEWARTICLE ON DRY POLYHERBAL POWDER SHAMPOO

¹Ankita Bhujbal, ²Amol Jadhav, ³Pratiksha Bhakre ⁴Mohini Mane, ⁵Rajesh Oswal

^{1,2,3}Research Students, ⁴Assistant Professor, ⁵Principal

^{1,2,3}Genba Sopanrao Moze College of Pharmacy, Wagholi, Pune, Maharashtra, India.

ABSTRACT

The shampoo sector is probably the largest unit sale among the hair care products since shampoos are one of the cosmetic products used in daily life. Synthetic preservatives and detergents have sometimes been the cause of adverse effects among consumer. A more radical approach in reducing the synthetic ingredients is by incorporating natural extracts whose functionality is comparable with their synthetic ingredients. A shampoo is a cleaning aid for the hair and is counted among the foremost beauty products.

Today's shampoo formulations are beyond the stage of pure cleaning of the hair. Additional benefits are expected, e.g. conditioning, smoothing of the hair surface, good health of hair, e.g. hair free of dandruff, dirt, grease and lice and, above all, it is safety benefits are expected. As the scalp is one of the most absorbent part of the body, product applied to the scalp go directly to the blood, without being filtered in any way.

Formulation of shampoo must be safe and efficient for long use. The major objective of the present study was to formulate an herbal shampoo powder by means of eliminating harmful synthetic ingredients and substitutes them with natural ingredients. Our formulated herbal shampoo powder consists of fenugreek, hibiscus, ashwagandha, shikkakai, amla, neem, reetha, cinnamon, kalonji, and rose petals in appropriate ratio.

Keywords:

Herbal shampoo powder, Organoleptic properties, Formulation and evaluation methods.

Introduction:

Hair-care products may be defined as the preparation which are meant for cleansing, modifying the texture, changing of the color, giving life to the stressed hair, providing nourishment to the hair and giving the healthy look to the hair.

Shampoo:

Shampoos are most probably used as cosmetics. It is a hair care product that is used for cleaning scalp and hair in our daily life. Shampoos are most likely utilized as beautifying agents and are a viscous solution of detergents containing suitable additives preservatives and active ingredients. It is usually applied on wet hair, massaging into the hair, and cleansed by rinsing with water. The purpose of using shampoo is to remove dirt that is build up on the hair without stripping out much of the sebum.

Methods:

Herbal shampoo powders were accurately weighed, passed through sieve, prepared by mixing in their ascending order of quantities with continuous trituration, stored in air tight containers and used for further studies. Formulation is subjected to organoleptic studies, general powder characteristics, physicochemical evaluation, ash value, moisture content determination, pH determination, cleaning action, foaming index, dirt dispersion, wetting time, etc.

History:

Shampoo originally meant head massage in several North Indian languages. Both the word and the concept were introduced to Britain from colonial India. The word *shampoo* in English is derived from Hindi *chāmpo* (Its English usage in Anglo- Indian dates to 1762. In India the term *champo* was used for head massage, usually with some form of hair oil.

The term and service were introduced in Britain by a Bengali entrepreneur Sake Dean Mahomed in 1814, when Dean, together with his Irish wife, opened ashampooing bath known as ‘Mahomed’s Indian Vapor Baths’ in Brighton, England. His baths were like Turkish baths where clients received an Indian treatment of champi (shampooing) or therapeutic massage. His service was appreciated; he received the high accolade of being appointed ‘Shampooing Surgeon’ to both George IV and William IV.

In the 1900s, the meaning of the word shifted from the sense of massage to the that of applying soap to the hair. Earlier, regular soap had been used for washing hair.

However, the dull film soap left on the hair made it uncomfortable, irritating, and unhealthy looking. During the early stages of shampoo, English hair stylists boiled shaved soap in water and added herbs to give the hair shine and fragrance. Kasey Hebert was the first known maker of shampoo, and the origin is currently attributed to him. Originally soap and shampoo were very similar products; both containing surfactants, a type of detergent. Modern shampoo as it is known today was first introduced in the 1930s with *Drene*, the first synthetic (no soap) shampoo.

In India, the traditional hair massage is still common. Different oils and formulations with herbs may be used; these include neem, shikakai or soapnut, henna, bael, Brahmi, fenugreek, buttermilk, amla, aloe, and almond in combination with some aromatic components like sandalwood, jasmine, turmeric, rose, and musk.

How shampoo works:

Shampoo cleans by stripping sebum from the hair. Sebum is an oil secreted by hair follicles that is readily absorbed by the strands of hair, and forms a protective layer. Sebum protects the protein structure of hair from damage, but this protection comes at a cost. It tends to collect dirt, styling products and scalp flakes. Surfactants strip the sebum from the hair shafts and thereby remove the dirt attached to it.

While both soaps and shampoos contain surfactants, soap bonds to oils with such affinity that it removes too much if used on hair. Shampoo uses a different class of surfactants balanced to avoid removing too much oil from the hair.

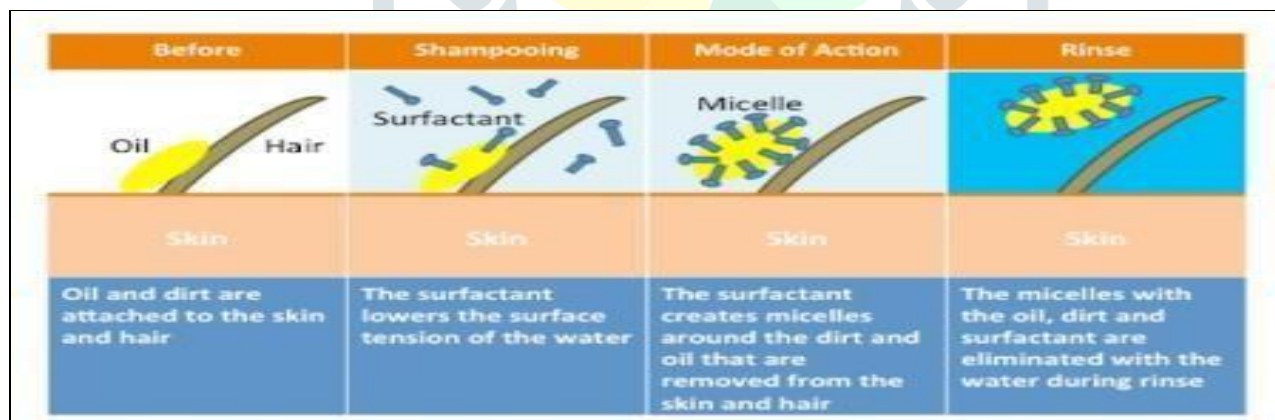


Fig.01 working of shampoo

The chemical mechanisms that underlie hair cleansing are similar to that of traditional soap. Undamaged hair has a hydrophobic surface to which skin lipids such as sebum stick, but water is initially repelled. The lipids donor comes off easily when the hair is rinsed with plain water. The anionic surfactants substantially reduce the interfacial surface tension and allow for the removal of the sebum from the hair shaft. The non-polar oily materials on the hair shaft are solubilized into the surfactant micelle structures of the shampoo and are removed during rinsing. There is also considerable removal through a surfactant and oil “roll up” eff

Ideal characteristics of shampoo:

Shampoo formulations seek to maximize the following qualities:

1. Easy rinsing
2. Good finish after washing hair
3. Minimal skin/eye irritation
4. No damage to hair
5. Feels thick and/or creamy
6. Pleasant fragrance
7. Low toxicity
8. Good biodegradability of ingredients
9. Slightly acidic (pH less than 7), since a basic environment weakens the hair by breaking the disulfide bonds in hair keratin.

TYPES OF SHAMPOO:

According to the nature of the products the shampoo products can be classified as follow.

1. Powder shampoos
2. Clear liquid shampoos
3. Liquid cream or lotion shampoos
4. Solid cream/gel shampoos
5. Oil shampoos
6. Miscellaneous including anti-dandruff medicated shampoo

BENEFITS OF HERBAL SHAMPOO-

1. More shine
2. Less hair loss
3. Long lasting color
4. Stronger and more fortified hairs
5. All natural, no chemicals
6. Won't irritate skin or scalp.

ADVANTAGES OF HERBAL SHAMPOO OVER CHEMICAL SHAMPOO:

Chemical shampoos might appear to be improving hair texture along the length but eventually end up damaging the roots and cause:

1. Premature aging, graying of hair
2. Scalp dryness and itchiness
3. Split-Ends and Excessive hair loss
4. To combat all such problems, it is best to switch to an herbal shampoo which will make up for the loss of nutrients and nullify the damage way.

The advantages of this herbal formulation are,

1. Free from the side-effects
2. No surfactants e.g.: SLS,
3. No synthetic additives,
4. Good Stability.
5. They are less harmful as compared to commercial shampoos.

Exposure to harmful chemicals is kept to a minimum and as for the all-natural one, there is no exposure to harmful chemicals at all.

The aim was to formulate a polyherbal shampoo containing natural ingredients with an emphasis on safety and efficacy, which will avoid the risk, posed by chemical ingredients and also reduce production cost.

ANATOMY OF HAIR FOLLICLE:

The hair follicle is a complex epithelial structure and is enclosed by an outer root sheath (ORS), which helps to support hair growth, and an inner root sheath (IRS), and follows the hair fiber up to the opening of the sebaceous gland. The ORS and IRS are separated by the companion layer. The IRS can be subdivided into three distinct layers: Henle's layer, Huxley's layer and the cuticle of IRS. Besides these two layers, ORS and IRS, the hair follicles are composed of four other different epidermal layers: hair matrix, medulla, cortex and cuticle, as well as two dermal tissues: dermal papilla and dermal sheath. Among

these layers, only the medulla is not always present, given that some hairs have no medulla and others have a medulla relatively large. Each layer itself can comprise numerous individualized cell layers characterized by specific programs of differentiation.

The rate of hair growth has been reported to be varying with sites. Scalp and chin have highest rate of growth. The rate of growth of scalp hair is between 0.27-0.40 mm per day. The growth rate of axillary hair is nearly same. The growth rate for hair on surface is about 0.2 mm per day. Though the daily variations of temperature have no effect on the growth rate but the study indicates higher growth rate of beard in summer than winter. Also, there is one study report which indicated that the growth of scalp hair in women is faster than men. The growth rate of scalp hair is more in young and adults and declines in old age.

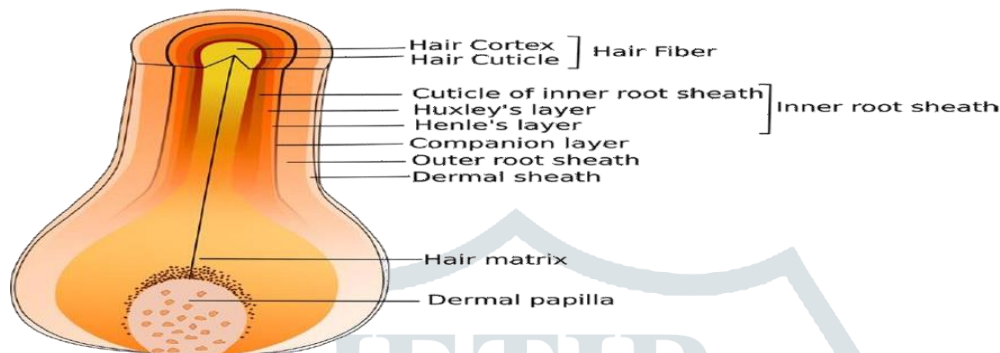


Fig1. Schematic cross-section of hair follicle

Within the skin, the terminal region growing cells that produce the long, fine and cylindrically shaped hair fiber, dermal papilla and surrounding dermal sheath.

Additionally, hair bulb also contains very specialized cells, the melanocytes, which produce the pigment melanin that gives color to the hair fiber.

PHYSIOLOGY OF HAIR:

Hair growth cycle: Hair development is a continuous cyclic process and all mature follicles go through a growth cycle consisting of growth (anagen), regression (catagen), rest (telogen) and shedding (exogen) phases. The duration of the phase's changes based on the location of the hair and also personal nutritional and hormonal status and age.

1. **Anagen:** The inception of anagen phase is presented by the onset of the mitotic activity in the secondary epithelial germ located between the club hair and dermal papilla in telogen hair follicle. The anagen is the active growth phase in which the follicle enlarges and takes the original shape and the hair fiber is produced. Almost hair cm^2 on average with variable range of 175-300 hair cm^2 . The rate of hair growth has been reported to be varying with sites. Scalp and chin have highest rate of growth. The rate of growth of scalp hair is between 0.27-0.40 mm per day. The growth rate of axillary hair is nearly same. The growth rate for hair on surface is about 0.2 mm per day. Though the daily variations of temperature have no effect on the growth rate but the study indicates higher growth rate of beard in summer than winter. Also, there is one study report which indicated that the growth of scalp hair in women is faster than men. The growth rate of scalp hair is more in young and adults and declines in old age.

85-90% of all scalp hairs are in anagen. Six portions of the anagen stage are demonstrated. Through the anagen I-V, hair stem cells proliferate, enclose the dermal papilla, grow downwards to the skin and begin to proliferate hair shaft and IRS, respectively.

Subsequently, hair matrix melanocytes begin to develop pigment and the form of the hair shaft begins to arise; in anagen VI, hair bulb and adjacent dermal papilla formation is realized and the new hair shaft appears from the skin. This phase can last up to 6-8 years in hair follicles. Hair shaft synthesis and pigmentation only takes place in anagen. The degree of axial symmetry within the hair bulb determines the curvature of the final hair structure. Fiber length is often dependent on the duration of the anagen or actively growing phase of the follicle.

The featured regulatory proteins in anagen phase are BMPs, sonic hedgehog, several WNT proteins and receptors. Insulin like growth factor-1 (IGF-1), fibroblast growth factor-7, hepatic growth factor (HGF), and vascular endothelial growth factor (VEGF) are thought to be important for anagen maintenance.

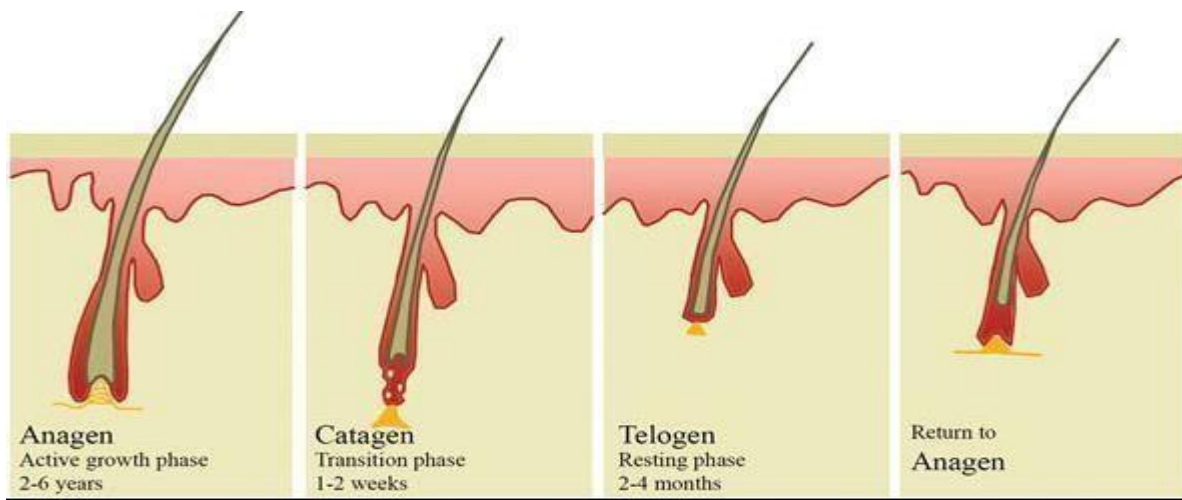


Fig. 2 Hair life cycle

1. **Catagen:** At the end of anagen, mitotic activity of the matrix cells is diminished and the follicle enters a highly controlled evolutionary phase known as catagen. Catagen lasts approximately 2 weeks in humans, regardless of the site and follicle type. During catagen the proximal part of the hair shaft is keratinized and forms the clubhair, whereas the distal part of the follicle is involuted by apoptosis.

Catagen phase is consisted of eight different stages. The first sign of catagen is the termination of melanogenesis in the hair bulb. Follicular epithelium, mesenchyme, neuroectodermal cell populations and also perifollicular vascular and neural systems demonstrates cyclic changes in differentiation and apoptosis. However, any apoptosis is occurred in dermal papilla due to the expression of suppressor bcl-2.

Catagen is a process of bulbar involution. The perifollicular sheath collapses and vitreous membrane thickens. Eventually, the lower hair follicle becomes reduced to an epithelial strand, bringing the dermal papilla into close proximity of the bulge. The epithelial strand begins to elongate and finally reaches to just below the insertion of pillar muscle. After the keratinization of the presumptive club hair, the epithelial strands begin to involute and shorten progressively followed by the papilla which condenses, moves upward and locates to rest below the bulge. The Column eventually reduces to a nipple and forms secondary hair germ below the club. The presence of hairless gene mutation contributes to the failure of dermal papilla migration toward the bulge area in catagen phase.

2. **Telogen:** The telogen stage is defined as the duration between the completion of follicular regression and the onset of the next anagen phase. Telogen stage lasts for 2–3 months. Approximately 10–15% of all hair is in telogen stage. During the telogen stage, the hair shaft is transformed to club hair and finally shed. The follicle remains in this stage until the hair germ which is responsive to anagen initiating signals from the dermal papilla, starts to show enhanced proliferative and transcriptional activity in late telogen, leading to the initiation of anagen. Telogen is one of the main targets of hair cycle which is influenced by several modulator agents like androgens, prolactin, ACTH, retinoids and thyroid hormones. Germ cells of telogen follicles also express bicuculline and FGF-5. The bone morphogenic protein-4 (BMP-4) as a growth factor plays an essential role in suppressing follicular growth and differentiation at telogen stage. The macro-environment surrounding the hair follicle also takes part in regulating cycle transitions. Telogen with a hair germ that is responsive to anagen-initiation signals and capable of entering a new anagen phase.

3. **Exogen:** There is less interest for the mechanism of the hair shedding but from the patient's perspective it is probably the most important part of the hair growth. It is not unusual for human telogen hairs to be retained from more than one follicular

cycle and this suggest that anagen and exogen phases are independent. The shedding period is believed to be an active process and independent of telogen and anagen thus this distinct shedding phase is named exogen

All body hairs undergo a similar life cycle, although its extent, the duration of its phases and the length of individual shafts vary between different body areas and between individuals, depending on genetic programming, gender, age and health status.

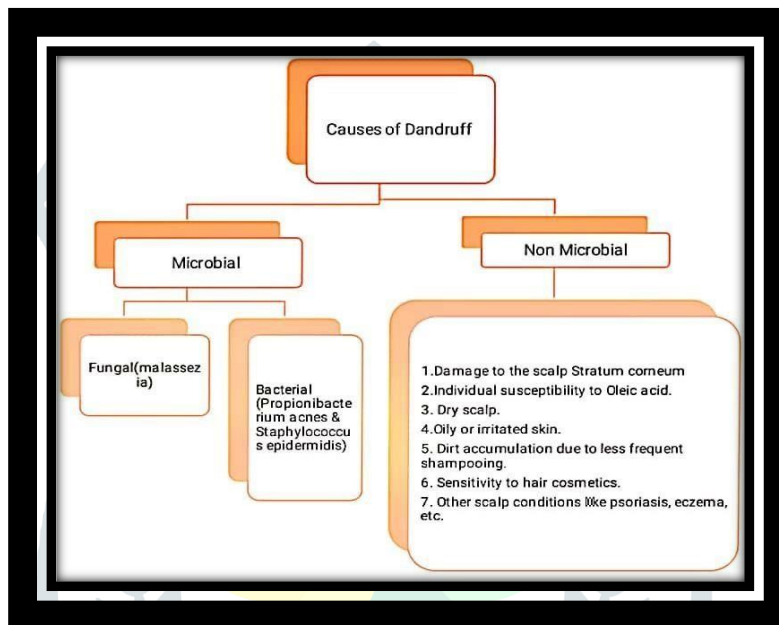
There can be some ailments to the normal health of hair and can cause trouble ailments like dandruff, hair loss, etc.

Dandruff:

Dandruff represents one of the most common dermatological skin conditions and is a chronic, non-inflammatory condition of the scalp that is characterized by excessive scaling of scalp tissue. Dandruff affects 5% of the population and mostly occurs after puberty, between 20 and 30 years and dandruff affects males more than females. [9] Dandruff is a common scalp disorder, characterized by presence of coenocytes that form clusters due to their high cohesive power, in the form of flaky white to yellowish scales, accompanied by itching.

Signs and symptoms:

1. Itchy scalp
2. Flakiness
3. Red and greasy patches of skin
4. Tingly feeling on the skin

Causes: -**Treatment:**

Dandruff is known to be controlled by fungistatic ingredients in Anti-dandruff shampoos. *Herbal shampoo* has growing demand in the world market. The natural remedies are more acceptable in market because it's safe and fewer side effects. Antidandruff shampoo and nutritional shampoo containing vitamin, amino acids, proteins hydrolysate. Synthetic and *herbal shampoo* both are having antidandruff action. But synthetic shampoo contains cationic, anionic and non-anionic surfactant mix in these surfactants having good foaming character but it's toxic and caused irritation of eye. An herbal antidandruff shampoo can be formulated which is not only equal to the conventional shampoo in its consistency but also has better health, efficacy and purity.

Hair loss:

Although hair loss is not a serious problem for general health, it is a matter of concern because it can lower self-confidence and create feelings of inferiority. 70- 100 hairs loss a day is very common however, dropping over 100 hairs a day lasting longer than a couple of weeks indicates a serious problem.

In general, patients with alopecia have a higher incidence of psychiatric disorders such as depression, anxiety, and social phobia compared to the rest of the population.

Cause of hair loss:

Androgenetic alopecia (AGA) is more prevalent in men, it is a widespread dermatological problem that also affects women. Up to 30%, 50%, and 80% of the men affected are over the ages of 30, 50, and 80 respectively. Androgens play an important role that appears to be independent from genetic predisposition, which is considered the main etiologic factor in AGA.

Testosterone is converted into its more potent form dihydrotestosterone (DHT) by the enzyme 5 α -reductase (5 α -R). The AGA-prone scalp has high levels of DHT and augmented androgen receptor (AR) expression. Inflammatory processes are also increasingly being cited as an integral part in the pathogenesis of AGA.

In AGA, scalp biopsies from both men and women revealed follicular Microinflammation and lymphocytic folliculitis, targeting an immunologically driven trigger. One of the factors leading to permanent hair loss in AGA may be this continuous inflammation and remodeling of the connective tissue of follicles.

Telogen effluvium (TE) is another frequent cause of diffuse hairless, but the true incidence is not well known because of insufficient data, especially due to subclinical cases. Although TE may be one manifestation of various chronic systemic illnesses, an association between stress and hair loss is well accepted among clinicians. The sensitivity of human hair follicles to skin-stress mediator has been demonstrated: organ-cultured hair follicles responded to substance P with premature catagen. Development and degranulation of mast cells in the connective tissue sheath of hair follicles, indicating a neurogenic inflammation.

Acute TE due to oxidative stress induced by ultraviolet radiation has also been identified. Photo activation of porphyrin compounds produced by bacteria in the pilosebaceous duct led to oxidative tissue injury and follicular micro inflammation. Currently, although topical minoxidil and oral finasteride are the only medications approved for AGA, cause-oriented treatments performed for TE.

OTHER CAUSE OF HAIR LOSS:

1. Acute illness
2. Autoimmune disorders
3. Chemicals (hair dyes)
4. Chemotherapeutic agents/ drugs.
5. Diabetes
6. Hair loss following childbirth
7. Hair styling products
8. Hair styling techniques
9. High iron deficiency
10. Nutritional deficiencies
11. Other fungal infections
12. Physical trauma to the scalp
13. Poisons
14. Poor blood circulation
15. Poor diet or malnutrition
16. Prescription drugs
17. Psychological
18. Radiation exposure
19. Ringworm
20. Skin disease
21. Stress
22. Sudden weight loss
23. Surgery
24. Thyroid disease.

Treatment:

Herbal shampoo and solution containing a mixture herbal extract (HE) with ant androgenic, anti-inflammatory, ant oxidative features. Our hypothesis was that, if there is a high enough concentration of relevant flavonoids, vitamins, and trace elements at the site of action (i.e., hair follicles), then inflammatory and aging processes can be slowed down and reversed to ascertain extent. This study was performed to assess the efficacy, safety, and synergy of the new cosmetic herbal shampoo and solution for treatment of AGA or TE.

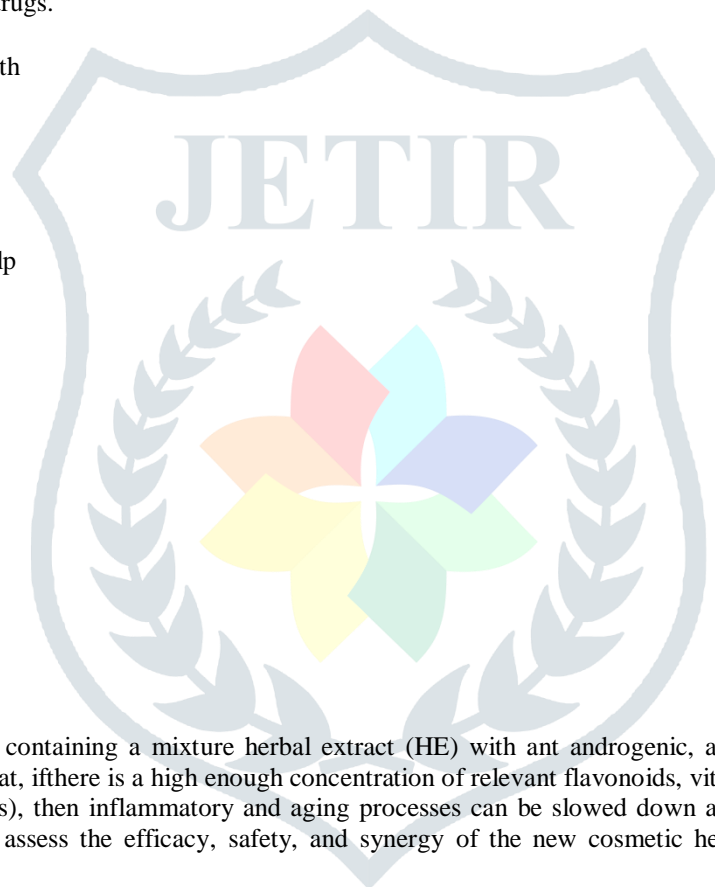
Ingredient:

1. Amla:

Synonyms: Indian gooseberry, Embolic myrobalan.

Biological Source: Amla consists of the fresh or dried fruit of *Emblica officinalis* Gaertn. (syn. *Phyllanthus embolic* Linn) Family: Euphorbiaceous.

Uses: used for hair growth, antidandruff, hair darkening, reduces hair loss.





2. Ashwagandha:

Synonyms: Withania root. Ashwagandha, Clustered Winter cherry.

Biological Source: It consists of the dried roots and stem bases of *Withania somnifera* Dunal,

Family: Solanaceae.

Uses: Improves circulation.



3. Cinnamon:

Synonyms: Cortex cinnamon, Ceylon cinnamon, Saigon cinnamon, Chinese cassia, *Cinnamomum aromaticum*, *Cinnamomum Laurus*.

Biological Source: Cinnamon is the dried inner bark of the coppiced shoots of *Cinnamomum zeylanicum* Nees.

Family: Lauraceae

Uses: lice treatment, hair growth promoter, reduce hair loss, antifungal.



4. Kalonji:

Synonyms: Small Fennel, Nigella Seed, Black Cumin, Fitch (Biblical),

Biological Source: It consists of seeds of *Nigella sativa* Linn

Family: Ranunculaceae

Uses: Improves scalp health, reduce dryness, improves blood circulation, promote hair growth, prevent premature graying, reduce hair fall.



5. **Neem:**

Synonym: Neem, Margosa, Azadirachta.

Biological Source: Neem consists of almost all parts of the plants which are used as drug. Some important morphological parts are the dried stem bark, root bark, leaves and fruits of *Azadirachta indica* also, known as *Melia azadirachta*.

Family: Meliaceae

Uses: Antiseptic, antibacterial.



6. **Methi**

Synonyms: Fenugreek, Greek hay.

Biological Source: It consists of dried seeds of *Trigonella foenum-graecum* Linn.

Family: Fabaceae.

Uses: Cleaning, softening and shining of hairs.



7. Shikakai:

Synonyms: Shikakai, sap-pod.

Biological sources: It consists of dried fruit of *Acacia concinna*.

Family: Mimosaceae.

Uses: foaming & antidandruff.

**8. Hibiscus:**

Synonyms: Red hibiscus.

Biological sources: It consists of dried flower of *Rosa sinensis*

Family: Malvaceous

Uses: hair conditioning, treat itchy scalp, prevent premature graying.



9. Reetha:**Synonyms:** Soapnut, washnut ,etc.**Biological sources:** It consist of dried fruit of *Spindus mukorossi*.**Family:** Sapindaceae**Uses:** Foaming and detergent.**10. Rose:****Synonyms:** Rose**Biological source:** It consists of dried petals of *Rosa centifolia*.**Family:** Rosaceae.**Uses:** Promote hair growth, Fragrance.**Materials and methods:**

The herbal shampoo powder was formulated using above natural ingredients,selected herbal drugs in dried form were purchased from the authenticated agencies. Herbs along with their part used in shampoo and quantity taken are tabulated in Table 1. Herbal shampoo was prepared by uniformly powdering and mixing in ascending order by weight with continuous trituration.

formulation table

Ingredients	Quality & Use
Shikakai (<i>Acacia concinna</i>)	10% (anti-dandruff)
Methi (<i>Trigonella foenum-graecum</i>)	10% (cleaning agent)

Hibiscus (<i>Rosa sinensis</i>)	10% (conditioning agent)
Neem (<i>Azadirachta indica</i>)	5% (anti-bacterial)
Ashwagandha (<i>Withaniasomnifera</i>)	5% (scalp circulation & nourishment)
Reetha (<i>Spindus mukorossi</i>)	20% (foaming)
Amla (<i>Embllicaofficinalis</i>)	15% (hair darkening)
Cinnamon (<i>Cinnamomum zeylanicum</i>)	8% (anti-lice agent)
Kalonji (<i>Nigella sativa</i>)	15% (hair growth)

PROCEDURE OF FORMULATION:

Formulation of herbal shampoo powder

Drying: All the powder are in dry form and grinded.

Weighing: All the required herbal powders for shampoo preparation were weighed individually.

Size reduction: The crude ingredients were collected and these ingredients were size reduced using hand driven mixer individually. Mixing: All these fine ingredients were mixed thoroughly by mixer to form a homogenous fine powder.

Sieving: Then this fine powder was passed through sieve no: 80, to get the sufficient quantity of fine powder.

Packing and labeling: Then it was packed and labeled suitably. Preparation Quantity taken for 100g of Herbal Powder Shampoo.

EVALUATION:

Prepared formulation of shampoo was subjected to following evaluation parameter.

A. Organoleptic character

1. Odor
2. Color
3. Texture

B. Angle of repose

C. Bulk density

D. Tap density

E. Moisture content

F. Dirt dispersion

G. pH

H. Ash value

1. Total ash value
2. Acid insoluble ash

I. Washability

J. Water solubility

K. Foaming index

A. Organoleptic character:

Organoleptic evaluation studies were performed by taking the samples randomly for the parameters like color, odor Taste and texture.

B. Angle of repose:

Angle of repose affects the flow properties of a powder. It was determined by 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

bottomtip of 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 pile.

C. 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 interparticulate 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 volume of 50 ml graduated cylinder was taken and required amount of herbal shampoo powder was added to the graduated cylinder. 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.

Bulk density = Mass of powder / Bulk volume of the powder

D. 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).

Tapped density = Mass of the powder / Tapped volume of the powder

E. Moisture content:

Moisture content in the formulation is very important as it contains herbs which 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.

F. Dirt dispersion:

Two drops of *herbal shampoo* were added in 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.

G. PH:

The pH of 10% shampoo solution in distilled water was determined at room temperature 25° C. The pH was measured by using a digital pH meter.

H. Ash value:

a). Total ash:

Ash value is calculated to determine the inorganic contents which are characteristic for an herb. About 2 Gm of powder drug was taken in a silicon dish previously ignited and weighed. Temperature was increased by gradually increasing the heat not exceeding to red color. 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 dil. HCl for 5 min, insoluble matter was collected in a Gooch crucible, washed with hot water, ignited and weighed.

I. Washability:

Formulations were applied on the skin and then ease and extent of washing with water were rechecked manually.

J. 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.

K. 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.

Foaming index = 1000/a

L. Skin/eye irritation:

The eye and skin irritation tests revealed that the herbal *shampoo powder* shows no harmful effect on 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 effect on skin and eye.

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.

References:

1. Surupsing M. Vlavi*, Akash D. Patil et al. 2017 Formulation and Evaluation of Herbal Shampoo Powder, *International Journal of Pharma And Chemical Research*, Volume 3, Issue 3, 492-498.
2. Rhea Jacob, Sakthivel, K. M., Kannan, N. and *Guruvayoorappan, 2015 formulation of cost effective herbal shampoo powder: a comparative study with market shampoos *International Journal of Current Research* Vol. 7, Issue, 02, pp.12645- 12649.
3. Akula Nikhil Prashant* 2015, preparation and evaluation of shampoo powder containing herbal ingredients, *Asian Journal of Pharmaceutical and Clinical Research*, Vol 8, Issue 1, 266-270.
4. Sachin Dubey*, Neelesh Nema* and S. Nayak*, 2004, Preparation and Evaluation of Herbal Shampoo Powder, *Ancient Science of Life*, Vol : XXVI (1), Pages 38-44
5. Jennifer Gubitosa, Vito Rizzi, Paola Fini and Pinalysa Cosma, 2019, Hair Care Cosmetics: From Traditional Shampoo to Solid Clay and Herbal Shampoo
6. Sutar Manisha*, Deshmukh Swati, Chavan Manisha, Singh Sonia 2013, preparation and evaluation of polyherbal shampoo powder, *International Journal of Pharmacy and Biological Sciences*, Volume 3, Issue 2, 151-159
7. Wani Snehal, Khot Nitin and Buchake Vaibhav V, 2014, Preparation & evaluation of anti-dandruff polyherbal powder shampoo *Pharmacophore*, Vol. 5 (1), 77-84
8. Kancharla. Kameswararao et al. Formulation and Evaluation of Polyherbal Shampoo, *Ijppr.Human*, 2018; Vol. 13 (1): 251-268.
9. Abhishek Singh*, Abhishek Saxena, 2020, Formulation and Evaluation of Herbal Anti- Dandruff Shampoo from Bhringraj Leaves, *Pharmacy Practice and Research* Volume 1, Issue 1 (Page 5–11)
10. Priya D. Gaikwad, Kamini V. Mulay, Madhavee D. Borade, 2018, Formulation and Evaluation of Herbal Shampoo, *International Journal of Science and Research (IJSR)* ISSN: 2319-7064 Volume 9 Issue 3, page 29-31
11. Bhati Deepak, Dr. Aamer Quazi, Dr. Joshi Amol, Sable Kundan, 2020 Formulation and Evaluation of Anti-Dandruff Shampoo, *IJESC*, Volume 10 Issue No.3 page 25116-25122
12. M.Surya Prabha*, A.Sravani, A.Spandana, N.Ramarao, M. Santhosh Aruna, 2014, Formulation and Evaluation of Herbal Hair Powder against Dandruff, *Int. J. Pharm. Sci. Rev. Res.*, 28(2), Article No. 09, Pages: 43-47
13. Vijayalakshmia*, Sangeetha, ranjithn, 2018, FORMULATION AND EVALUATION OF HERBAL SHAMPOO,
14. *Asian Journal of Pharmaceutical and Clinical Research*, Vol 11, Special Issue 4, , 121-124
15. Suyog Sunil Bhagwat, 2020, formulation and evaluation of herbal shampoo, *IJCRT*, Volume 8, Issue 9, 2860-286

16. Rupesh Rathore et al., 2019, Preparation and Evaluation of Powdered Herbal Shampoo Using Bhirngraj, *IJPLS* ,6275-6279
17. Utane R., Deo S .and Itankar P. 2017, preparation of herbal shampoo (hs) by green method and their characterization, *IJRSSIS*, Vol. V, : 254- 258
18. S H. Salehi and G. Heshmat , Efficacy of different essential oils, uses in case of treatment and control the head lice, *Int. J. Adv. Res.* 5(4), 2044-2047
19. R. Hamidpour et al. , Cinnamon from the selection of traditional applications to its novel effects on the inhibition of angiogenesis in cancer cells and prevention of Alzheimer's disease, and a series of functions such as antioxidant, anticholesterol, antidiabetes, antibacterial, antifungal, nematocidal, acaricidal, and repellent activities, *Journal of Traditional and Complementary Medicine* xxx (2015) 1-5
20. R. Araújo et al. 2010, Biology of Human Hair: Know Your Hair to Control It, *Adv Biochem Engin/Biotechnol Claude Bouillon , Shampoos, Clinics in Dermatology* 1996;14:113-121
21. Célia F. Cruz, et al., Human Hair and the Impact of Cosmetic Procedures: A Review on Cleansing and Shape-Modulating Cosmetics, *Cosmetics* 2016,3- 26
22. 24.B.M. Mithal, R.N. Saha, A hand book of cosmetics, Vallabh prakashan, 2006,105-116
23. 25.M. Narshana and P. Ravikumar , 2018, An overview of dandruff and novel formulations as a treatment strategy, *IJPSR*,; Vol. 9(2): 417-431
24. Krishna Sailaja A*, Veena RE and Vishwanayani D , 2019, Formulation of Herbal Shampoo to Treat Dandruff, *Drug Des Int Prop Int J*, Volume 3 - Issue 2, 336-338
25. E. Pekmezci et al., 2018, A proprietary herbal extract against hair loss in androgenetic alopecia and telogen effluvium: a placebo-controlled, single-blind, clinical-instrumental study, *Acta Dermatovenerol APA* , 51-57
26. Ashwini S. Pundka, et al., 2020, A review: herbal therapy used in hair loss, *Pharmaceutical Resonance* Vol. 3 -Issue 1, 44-50
27. Biren N. Shah, A.K. Seth , *Textbook of pharmacognosy and phytochemistry*, 1st edition 2010, ELSEVIER A division of Reed Elsevier India Private Limited
28. Sudhir et al., 2016, *Nigella sativa* seed, a novel beauty care ingredient: a review *IJPSR*, Vol. 7(8): 3185-3196.
29. Grover, et al., 2016 Therapeutic effects of amla in medicine and dentistry: a review, *Journal of Oral Research and Review*, 65-68
30. Lokesh Deb et al., Traditional indian herbs cinnamon *zeylanicum* and its health benefits, 11-20
31. Komal Khanpara*, Renuka, Dr. V. J. Shukla , Harisha C.R, 2012, A detailed investigation on shikakai (*acacia concinna* linn.) – fruit, *Journal of Current Pharmaceutical Research* 9(1): 06-10
32. Suhagia et al., 2011, *sapindus mukorossi* (areetha): an overview, *IJPSR*, 2011; Vol. 2(8):1905-1913
33. Vincenta Khristi and V. H. Patel , 2016, Therapeutic potential of hibiscus *rosa sinensis*: a review , *International Journal of Nutrition and Dietetics*, Volume 4, Number 2, Pages 105-121
34. 24.B.M. Mithal, R.N. Saha, A hand book of cosmetics, Vallabh prakashan, 2006,105-116
35. 25.M. Narshana and P. Ravikumar , 2018, An overview of dandruff and novel formulations as a treatment strategy, *IJPSR*,; Vol. 9(2): 417-431
36. Krishna Sailaja A*, Veena RE and Vishwanayani D , 2019, Formulation of Herbal Shampoo to Treat Dandruff, *Drug Des Int Prop Int J*, Volume 3 - Issue 2, 336-338
37. E. Pekmezci et al., 2018, A proprietary herbal extract against hair loss in androgenetic alopecia and telogen effluvium: a placebo-controlled, single-blind, clinical-instrumental study, *Acta Dermatovenerol APA* , 51-57
38. Ashwini S. Pundka, et al., 2020, A review: herbal therapy used in hair loss, *Pharmaceutical Resonance* Vol. 3 -Issue 1, 44-50
39. Biren N. Shah, A.K. Seth , *Textbook of pharmacognosy and phytochemistry*, 1st edition 2010, ELSEVIER A division of Reed Elsevier India Private Limited
40. Sudhir et al., 2016, *Nigella sativa* seed, a novel beauty care ingredient: a review *IJPSR*, Vol. 7(8): 3185-3196.
41. Grover, et al., 2016 Therapeutic effects of amla in medicine and dentistry: a review, *Journal of Oral Research and Review*, 65-68
42. Lokesh Deb et al., Traditional indian herbs cinnamon *zeylanicum* and its health benefits, 11-20
43. Komal Khanpara*, Renuka, Dr. V. J. Shukla , Harisha C.R, 2012, A detailed investigation on shikakai (*acacia concinna* linn.) – fruit, *Journal of Current Pharmaceutical Research* 9(1): 06-10
44. Suhagia et al., 2011, *sapindus mukorossi* (areetha): an overview, *IJPSR*, 2011; Vol. 2(8):1905-1913
45. Vincenta Khristi and V. H. Patel , 2016, Therapeutic potential of hibiscus *rosa sinensis*: a review , *International Journal of Nutrition and Dietetics*, Volume 4, Number 2, Pages 105