Preparation and Evaluation of Herbal Shampoo

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1. INTRODUCTION

Human beauty is incomplete without hair. Herbs have been used to clean, adorn, and manage hair since antiquity. Synthetic agents have gained popularity throughout time, but consumers are becoming more conscious of their negative effects on hair, skin, and eyes. These factors drew people to herbal products, which are less expensive and have fewer negative effects. Hair cleansers or shampoos are used not only to clean hair but also to add shine and keep hair manageable and oily. Shampoos are classified into powder shampoo, clear liquid shampoo, liquid shampoo, lotion shampoo, solid gel shampoo, medicated shampoo, liquid herbal shampoo, and so on. In terms of stability criteria, herbal shampoos. They can be simple or plain shampoo, antiseptic or antidandruff shampoo, or nutritional shampoo containing vitamins, amino acids, proteins, and hydrolysate. Herbs have been used to maintain health and treat disease since the dawn of time. Various literatures give a wealth of knowledge about folklore traditions in various sections of the country, as well as traditional aspects of functionally essential natural items and their application in skin and hair care. Phytochemical substances have a lot of potential in hair care, and they also supply nutrients to the body. Herbs have long been associated with hair care, and they are frequently included in conditioners, shampoos, and rinses. The selection of active ingredients for hair care powder is frequently based on the ingredient's ability to prevent skin damage as well as improve skin quality by cleansing, nourishing, and protecting the skin. In this paper, we report the development and evaluation of polyherbal hair care shampoo (3).

Shampoo is used by a large number of people, both men and women, to wash their hair. One of shampoo's primary functions is to remove dirt from the hair. The dirt is made up of sebum produced by the scalp, sweat residue, horny layer flakes, residue from hair care cosmetics, dust, and other external matter that has settled on the hair. Several synthetic shampoo derivatives have been shown to be harmful. People are becoming more aware of their effects on hair. Because of these factors, the community is becoming more interested in herbal products due to their low cost and negligible side effects. Nowadays, the use of herbs in cosmeceutical production has greatly increased, and there is a high demand for herbal cosmetics. This polyherbal shampoo was created with natural ingredients such as eclipta prostrata, Sapindus mukorossi, Aloe barbadensia, glycyrrhiza glabra, emblica officialis, Azadirachta indica, Hibiscus roseasinesis, (3)
Hair problems include: hair loss, white hair, dandruff, and split ends. Tension, scalp infection, hormone disruptions, low vitamin, food, and mineral intake, and excessive chemical shampoo use are all causes of hair problems. The main goal of our project was to solve all of these problems. As a result, we created polyherbal antidandruff shampoo, a multipurpose shampoo for hair treatment. Hair and scalp cleanliness are among the most important personal life considerations today. Dandruff is a clinical condition caused by the Malassezia (Pityrosporum) species that is a major cosmetic concern throughout the world. Pityrosporum ovale is thought to play a role in the development of seborrheic dermatitis. Fungistatic ingredients in antidandruff shampoos are known to control dandruff. The global market for herbal formulations is expanding. Natural remedies are more popular in the market because they are safer and have fewer side effects antidandruff shampoo. People are becoming more reliant on herbal or ayurvedic formulations not only for chronic ailments but also for a variety of acute problems. Ayurvedic formulations have proven to be promising for cosmetic use due to the assurance of therapy with minimal side effects. In the context of changing eating habits, stress A variety of skin and hair disorders are encountered, depending on the level and conditions of the environment. Maintenance of other factors will not meet the need, so extraneous treatment is required. Safe. In the case of hair disorders such as dandruff, a proper selection of ayurvedic ingredients with their properties is essential. To combat dandruff, the required amounts and dosage form can be formulated as shampoo. The herbal shampoo powder was formed with natural ingredients such as Acacia concinna (shikakai), Lawsonia inermis (henna), Aloe Vera (aloe), Ocimum sanctum (tulsi), Azadiracta indica (Neem), and Fenugreek (methi). Both have anti-dandruff properties.

Shampoos are probably the most commonly used cosmetic products in our daily lives for cleansing our hair and scalp (Ishi, 1997). A shampoo is basically a detergent solution containing appropriate additives for additional benefits such as hair conditioning, lubrication, medication, and so on. Many synthetic, herbal, medicated, and non-medicinal products are available these days. Although medicated shampoos are available on the market, the popularity of herbal shampoo among consumers is growing because they believe these products are of natural origin side effects-free.

Synthetic surfactants are added to shampoo primarily for foaming and cleansing action, but their continued use causes hair dryness, hair loss, scalp and eye irritation (Potluri et al., 2013). Herbal formulations are seen as an alternative to synthetic shampoo, but when it comes to cosmetics, it is difficult to find entirely natural raw materials. There are many medicinal plants.
Which are said to be beneficial to hair and are shampoo formulation. These plant products can be used in powdered form. Crude form, purified extracts, or derivative form Herbal shampoo preparation is extremely difficult.

*Spindus mukorossi* pericarp, also known as Soapnut or reetha, *Phyllanthus emblica* fruits, also known as Amla, and dried pods of *Acacia concinna* (Sheekakai) have long been used in the Indian folklore system for centuries for hair washing. Reetha and Sheekakai produce a thick lather when shaken with water. Saponin content is high. They are also known to generate benefits to the skin and other organ systems. Amla fruit is high in vitamin C and is used in many recipes. Hair preparations for antidandruff and hair growth as well as to strengthen hair. The *Ziziphus spinachristi* tree, also known as Surd in Arabic, is native to the region. Its leaves are traditionally used in the Middle East, including Oman. (24)

1.1. HAIR STRUCTURE

Hair, protective appendages on the body, and integument structures with sebaceous glands, sweat glands, and nails are all considered important body parts derived from the skin ectoderm. They are also referred to as epidermal derivatives because they are derived from the epidermis during embryological development [2]. According to Naizet, the hair is made up of three parts: the bulb, the root, and the stem, and it is implanted in the dermal pilosebaceous follicle. The bulb is the deepest part of the hair and also the part that causes it to grow. It is linked to the densely innervated and vascularized dermal papillae, which allow nutrients required for hair growth to be delivered. The root is firmly fixed in the hair follicle, which is located between the bulb and the surface of the epidermis and is where the hair takes the form of the stem. The root and stem share three concentric layers: the medulla, cortex, and cuticle on the outside. The central core is the medulla. The cortex, the next stratum, is the largest and thickest part of the hair, determining many of its mechanical properties. The cortex is composed of densely packed spindle-shaped cortical cells that are filled with keratin filaments parallel to the longitudinal axis of the hair shaft and an amorphous matrix of high Sulphur proteins. Cysteine residues in adjacent keratin filaments, in particular, tend to form covalent disulfide bonds with a strong crosslink between adjacent keratin chains [9] contributing to the shape, stability, and texture of the hair. The cuticle is a tough layer of overlapping dead cells that forms a barrier against the outside environment and external aggressions. It is made up of endocuticle and exocuticle [10]. Normal cuticles are smooth, allowing light to reflect and limiting friction between hair shafts. It is, in fact, responsible for the lustre and texture of the hair. The cuticle is divided into three
layers: the b-layer, the a-layer, and the epicuticle [9]. The epicuticle is a hydrophobic lipid layer made of 18-methyleicosanoic acid on the surface of the fibre, or the f-layer, overlapping cuticle cells surrounding the elongated polyhedral cortical cells, as described by Hordinsky et al [9]. The interaction of the outer hydrophobic layer and the cortex results in the physical properties of shine and volume (body), which are necessary for the appearance of “healthy hair.” Indeed, when hair is damaged by frictional or chemical forces, the f-layer, the first hydrophobic defense, is removed, and the hair fibre becomes much more fragile [9]. It’s important to remember that hair fibres are made up of sulfur-rich proteins, lipids, water, melanin, and trace elements [9].

![Hair structure diagram](image)

**Fig.1.1 hair structure**

Keratin is the primary component of hair. It is a fibrous and resistant protein with a helix of amino-acidic chains containing primarily tyrosine, glycine, and cysteine. It is commonly found as acidic, neutral, and basic keratin. Keratin is the primary component of hair. It is a fibrous and resistant protein with a helix of amino-acidic chains containing primarily tyrosine, glycine, and cysteine. It is commonly found as acidic, neutral, and basic keratin. [23]

**1.2. HAIR CARE**

If hair texture and shine are usually related to hair surface properties, hair integrity is due to the hair cortex. Hair products that improve the structural integrity of hair fibres and increase tensile strength are available for this purpose, as are products that increase hair volume, reduce
frizz, improve hair manageability, and stimulate new hair growth. Interestingly, modern cosmetic products are designed to clean hair of debris while also restoring and improving hair physiology. For example, intensive conditioning agents can temporarily "replace" the f-layer, improving moisture retention in the cortex and rebuilding some of the hair's reduced physical properties. As a result, an increase in hair shine is a significant advantage of modern products. Herbal products were used for medicinal purposes in the past, both internally and externally. Herbal drugs were consumed in the form of juice, latex, or dried powder. Nowadays, personal care products contain the ingredient from plants are becoming more popular. In the pharmacy world a cosmetic product containing plant material as an active ingredient falls under the cosmeceuticals. Hair appearance influences an important influence on total body feature Color, length and the appearance of the hair make a significant difference from person to person Hair cosmetics oral care and should not be used for therapeutic benefit.\(^{(25)}\)

The basic feature of hair care cosmetics

- Should be simple to use
- Should have a local impact.
- Harmful to hair, skin, and mucous membranes.
- Should not be allergic to the human body.
- Should only be used topically.

Hair care cosmeceutical formulations primarily consist of Shampoo, gel, lotion solution, and oil are all available.\(^{(25)}\) Nanotechnology has been used to enhance hair care products such as shampoos, conditioners, dyes/colorants, hair growth promoters, and styling products. Cosmetic companies are currently attempting to discover the role of nanoparticles in preventing hair loss. Encourage hair growth, treat hair disorders, and keep shine, silkiness, and health strands of hair Nano emulsions, nanospheres, and liposomes are examples of nanocarriers. Improve the performance of hair care products Shampoo treats alopecia/baldness, silver nanoparticles treat bacteria-caused hair depilation, and sericin nanoparticles in hair products treat damaged hair cuticles\(^{(28)}\).
1.3. HAIR PROBLEMS

Common problems affecting the hair and scalp include hair loss, infections, and disorders causing itching and scaling. Hair loss (alopecia) is a frequent concern for both men and women, although it is normal to shed some hair each day.

- **Hair loss**

Hair loss is a common reason for male and female patients to consult the dermatologist. It is easy for the patient to state that their hair is falling out, but far more difficult for the physician to determine the exact cause and provide effective treatment. Hair can be shed for many reasons, some medical and some cosmetic.

People typically lose 50 to 100 hairs a day. This usually isn't noticeable because new hair is growing in at the same time. Hair loss occurs when new hair doesn't replace the hair that has fallen out.

Hair loss

Hair loss is typically related to one or more of the following factors:

- **Family history (heredity).** The most common cause of hair loss is a hereditary condition that happens with aging. This condition is called androgenic alopecia, male-pattern baldness and female-pattern baldness. It usually occurs gradually and in predictable patterns — a receding hairline and bald spots in men and thinning hair along the crown of the scalp in women.
- **Hormonal changes and medical conditions.** A variety of conditions can cause permanent or temporary hair loss, including hormonal changes due to pregnancy, childbirth, menopause and thyroid problems. Medical conditions include alopecia areata, which is immune system related and causes patchy hair loss, scalp infections such as ringworm, and a hair-pulling disorder called trichotillomania.

- **Medications and supplements.** Hair loss can be a side effect of certain drugs, such as those used for cancer, arthritis, depression, heart problems, gout and high blood pressure.

- **Radiation therapy to the head.** The hair may not grow back the same as it was before.

- **A very stressful event.** Many people experience a general thinning of hair several months after a physical or emotional shock. This type of hair loss is temporary.

- **Hairstyles and treatments.** Excessive hairstyling or hairstyles that pull your hair tight, such as pigtails or cornrows, can cause a type of hair loss called traction alopecia. Hot oil hair treatments and permanents also can cause hair to fall out. If scarring occurs, hair loss could be permanent.

**Hair dandruff**

Dandruff is a common dermatologic condition resulting in scalp symptoms such as flaking, crusting, erythema, itching, and hair breakage. It afflicts both males and females, but is more problematic in females due to hair length and the need to maintain the cosmetic value of the hair. Since sebum and scalp scale are well-known requirements for the initiation of dandruff, traditional dandruff shampoos usually focus on delivering active anti-dandruff ingredients and thorough removal of scale and sebum. These shampoos indeed improve the patient perception of dandruff, but often at the expense of hair beauty, resulting in decreased patient shampoo compliance. Furthermore, dandruff is a chronic, relapsing dermatologic condition related to fungal colonization of the scalp by Malassezia that requires continued use of the medicated shampoo. The recognition that hair cosmesis must be maintained while at the same time treating dandruff has led to the next generation of dandruff shampoos combining over-the-counter technologies for minimizing fungal colonization of the scalp and synthetic detergents to remove excess scalp sebum with silicone-based conditioners to maximize hair beauty. Dandruff is a common condition that causes the skin on the scalp to flake. It isn't contagious or serious. But it can be
embarrassing and difficult to treat. Mild dandruff can be treated with a gentle daily shampoo. If that doesn't work, a medicated shampoo may help. Symptoms may return later. Dandruff is a mild form of seborrheic dermatitis.

![Fig.1.2 hair dandruff](image)

**Dandruff sign & symptoms**

- Skin flakes on your scalp, hair, eyebrows, beard or mustache, and shoulders
- Itchy scalp
- Scaly, crusty scalp in infants with cradle cap

**Dandruff causes**

1) Irritated, oily skin
2) Dry skin
3) A yeast like fungus (malassezia) that feeds on oils on the scalps of most adults
4) Sensitivity to hair care products (contact dermatitis)
5) Other skin conditions, such as psoriasis and eczema

- **Gray hair**

White hair is more noticeable in people with a darker hair color. Although white hair is characteristic of aging, colorless hair strands can appear at any age — even while you’re still in high school or college. If you’re a teenager or in your 20s, you might find one or more strands of white hair.

There can be many causes besides age that result in a person’s hair turning white.

- **Vitamin deficiencies**
  - Any vitamin B-6, B-12, biotin, vitamin D, or E deficiency can contribute to premature greying. One 2015 report in the journal Development mentions various deficiency studies on vitamin D-3, vitamin B-12, and copper and their relationship to greying hair. It discovers that nutritional deficiencies influence pigmentation, implying that colour can be restored with vitamin supplementation.

- **Genetics**
  - Premature graying of a person’s hair is largely connected to genetics, according to a 2013 report in the *Indian Journal of Dermatology, Venereology and Leprology*. Race and ethnicity play roles, as well. Premature graying in white people can start as early as 20 years old, while a person can be as young as 25 years old among Asians, and 30 years in African-Americans populations, according to the 2013 study.

- **Oxidative stress**
  - While graying is mostly genetic, oxidative stress in the body may play a part when the process happens prematurely. Oxidative stress causes imbalances when antioxidants are not enough to counteract the damaging effects of free radicals. Free radicals are unstable molecules that damage cells, contributing to aging and disease. Too much oxidative stress can promote the development of diseases, including the skin-pigment condition vitiligo. Vitiligo may also turn the hair white due to melanin cell death or the loss of cell function.
• Certain medical conditions
  Some medical conditions, including autoimmune diseases, may increase a person’s risk for graying early. In fact, research published in 2008 showed a connection between dysfunction. White hair is also common in alopecia areata, an autoimmune skin condition that causes hair loss on the scalp, face and other parts of the body. When the hair grows back, it tends to be white due to melanin deficiency

• Real life stress
  There are conflicting research studies on real-life stress, such as that caused by injury, leading to premature graying. One study from New York University, reported in Nature Medicine, finds that the cells responsible for hair Colo Trusted Source can be depleted when the body is under stress. Other studies indicate that while stress may play a part, it is only a small part of a bigger picture where disease and other factors contribute.

• Smoking
  A study from 2013 reported in the Italian Dermatology Online Journal, shows that smokers are 2 1/2 times more likely to start grayingTrusted Source before age 30 as non-smokers. A 2015 study in the Journal of the American Academy of Dermatology also demonstrated that smoking is linked to premature white hair in young men Trusted Source

• Chemical hair dyes and hair products
  Chemical hair dyes and hair products, even shampoos, can contribute to premature hair graying. Many of these products contain harmful ingredients that decrease melanin. Hydrogen peroxide, which is in many hair dyes, is one such harmful chemical. Excessive use of products that bleach hair will also eventually cause it to turn white.
1.4. SHAMPOO

Shampoo is a cleanser designed to remove sebum, eccrine sweat, apocrine sweat, fungal elements, desquamated corneocytes, styling products, and environmental dirt from the scalp and hair. Shampoo treatments are the most commonly used means of managing hair and scalp conditions. Until the introduction of the first non-alkaline shampoos in 1933, soap was the only available cleanser for the hair. Modern shampoos are expected to be much more than mere cleansing agents. They are expected to not dry out the hair; to produce lather in hard and soft water and when applied to oily hair; to be non-irritating to skin and mucous membranes; to be chemically and physically stable; to possess conditioning benefits; to be biodegradable; and affordable. A shampoo is expected to improve the hair cosmetically while being tailored to the needs of various hair types as well as age and individual habits; at the same time, it should have a positive effect on specific problems involving the hair and scalp. Shampoos have thus evolved into high-tech products consisting of 10 to 30 ingredients that are combined in precise formulations to meet consumer demands.

Ingredients include:

- Detergents, i.e., surfactants
- Conditioning and active ingredients for hair manageability
- Additives that modify the surfactant effect (viscosity control agents, foam stabilizers),

The product (preservatives), and increase its appeal (fragrances, dyes, and ingredients for consistency and a pearlescent appearance). It can take more than a year from the initial planning phase to a saleable product. More effort is being invested in conditioners which are designed to give the hair a healthier appearance, making it shiny and smooth while increasing volume and resilience. Scalp condition is another important factor in individual health and well-being; the scalp should neither be oily nor should dandruff develop.

The most important effects of shampoo on the hair are:

- Moisturizing
- Adsorption and/or penetration of the hair
- Cleansing, removal of oils, lipid regeneration
The following effects of shampoo influence scalp condition:

- restoration of alkali neutralization ability (pH)
- dryness
- seborrhea
- scalp bacteria (Malassezia spp., Propionibacterium spp.)
- enzyme activity of the scalp
- scalp circulation

1.5. Types of shampoo

Various Types of Shampoo Shampoos may be marketed as clear or opaque liquids, liquid creams, gels, creams, foam aerosols, or powders to be dissolved at use. They may be classified according to the aims. The main types are as follows:

- **Ordinary shampoos** (shampoos most often used for family or economic use):
  - The goal here is to obtain good lather, cleanse hair well without excessive detergent action, and give hair sufficient combability and gloss without fluffiness. These shampoos are generally based on anionic surfactants such as alkyl sulfates or alkyl ether sulfates. Their distinctive image is usually a natural, vegetal, or biologic ingredient. Fragrance is important. They have no specific features, but it is possible to adapt them for different types of hair (dry hair, greasy hair) by varying the nature of the surfactant mixture, the amount of surfactants, or the additives. Frequently, a shampoo of this type is not an “end in itself” and is followed by the application of a conditioner.

- **Conditioning shampoos:**
  - In addition to their foaming and cleansing properties, shampoos in this category should impart suitable cosmetic properties to the hair and alleviate the defects related to certain types of hair. To dry hair, they should give combability, softness and lustre. To greasy hair, they should impart volume and lightness and reduce weighing down from regreasing. To fine hair, they should provide bounce, body, and hold. To dyed or bleached hair, they should give softness, gloss, and manageability. Formulating these shampoos is a more elaborate process than for other types. The detergent power of these shampoos must be monitored together with the conditioning effect. This can be done by using a combination of anionic
and amphoteric for cleansing. Cosmetic properties are contributed for the most part by additives such as cationic, non-ionic, and anionic polymers, and glossing and super fatting agents.

- **Special care shampoos:**

  - This group is mainly comprised of products for cleansing hair and scalp suffering from dandruff or excess greasiness. They are generally formulated around one or more specific ingredients selectively taken because of their fully operating action against these disturbances. The fight against dandruff is targeted at Pityrosporum ova/e, whose proliferation induces a quasi-inflammatory process reflected by a scaling condition. Specific inhibitors of this yeast must therefore be part of the formulation. For greasy condition, anionic shampoos with mild but efficient detergent action are generally preferred because they come in contact with a scalp that is often in a bad condition and needs to be restored. Even massage should be reduced to a minimum to avoid the abrasive effect of hair on scalp. Highly significant results have been obtained with a very mild surfactant mixture based on non-ionic polyglycerol derivatives.Regular use of this type of formulation has been shown to lengthen the delay before regreasing clearly and to progressively improve the scalp condition.

- **Frequent-used shampoos:**

  - In most countries, hygiene habits, increased participation in sports, and the use of various styling aids have all resulted in an increasingly more frequent use of shampoo. Be it a case of greasy hair or air pollution or sweat due to physical activity or cosmetic coating, the thing is to avoid excessive detergency. This class of shampoos therefore relies on a mixture of surfactants chosen for their mildness to hair and scalp coupled with sufficient ability to cleanse hair that may be more exposed and prone to soil. These shampoos are also carefully formulated in their conditioning features; they should enhance the beauty and combability of the hair while avoiding build-up of conditioning agents that would weigh down the hair.

- **Baby shampoos:**

  - Their prime requisite is safety and complete tolerance by the tender scalps and eye mucosa of babies and infants. The cleansing base is little detergent and consists mostly of associations of very mild anionic, amphoteric, and non-ionic surfactants. (32)
1.6. SHAMPOO INGREDIENTS

They are primarily composed of saponins, which are found in a variety of vegetal species, namely, Soap bark, soapwort, sarsaparilla, and ivy are all herbs. A sugar is the hydrophilic component. Which compares them to nonionic, but an acidic or basic group is frequently found in the lipophilic moiety of a steroid or triterpene. Soapbark, for example, has a lipophilic moiety in the form of quillaia acid. These saponins produce an excellent lather. But have below-average cleansing properties as a result, high concentrations are required to provide adequate deterrence. At Saponins are present in these concentrations. Aggression and may even exhibit unfavorable cosmetic characteristics as a result, natural surfactants are becoming more popular. Synthetic surfactants are frequently associated with to ensure thorough cleaning and satisfaction cosmetic excellence.

Foam stabilizer:

softeners, or both Customers value foam. It is psychologically associated with the detergent effect, but it is also an indication that the cleaning job has been completed (dosing element). The upstart of foam, its volume, softness, texture, stability, and removal by rinsing are all components of foaming qualities. These properties are primarily enhanced by the addition of fatty acid alkanol amides, which impart a creamy feel as well as a softer and more stable foam.

Thickeners:

Consistency and richness are provided by natural gums (karaya, Itragacanth), cellulose hydrocolloids (hydroxymethyl or hydroxyethyl or carboxymethyl cellulosae), acrylic polymers (such as carbomer), or salts such as sodium or ammonium chloride.

Opacifiers:

They are added to change the appearance of shampoos, but they may also play a softening part. The most frequently used are long-chain fatty alcohol sulfates or fatty acid esters.

Conditioners:

They are intended to bring softness and gloss, to reduce flyaway, and to enhance disentangling. They are particularly useful in shampoos for dry and damaged hair. Their role in a shampoo is not as effective as that of a conditioner or a rinse because of the multiple functions a shampoo has to comply with, the likelihood of incompatibilities or even conflicts resulting in a
compromise. They, however, have an essential role on the feel, appearance, manageability, and esthetic and cosmetic qualities of hair after shampooing. A great number of compounds may be added according to the type of formulation and cleansing base, the purpose and care and beautifying aims. They are mostly fatty ingredients (fatty alcohols, lanolin derivatives, vegetable or mineral oils, lecithins), proteins, and cationic polymers.

**Preservatives:** Preservatives are used to inhibit any bacteriologic contamination.

**Fragrances and colorants:** Fragrances and colorants are intended to individualize shampoo perception.
2. LITERATURE SURVEY

Khaloud Al Badi et al 2014: The concept of beauty and cosmetic is being highlighted and how it may counter through the herbal cosmetics. The preparation has mixture of various herbs (Reetha, Shikakai, Amla, Lavender oil, Sidr extract, Lemon juice) with methyl paraben and citric acid are added in the mixture. They gave the short description of each herb with the images to get it more simplified.\(^8\)

Dr. Gitika Dhingra et al 2019: It is an informative paper about the description of the herbal shampoo. It gives the brief information about the mechanism of action and uses of herbal shampoo which when used under specified conditions without adversely affecting the user. It also focuses on various hair problems like dandruff, lice and other scalp problems.\(^9\)

Vinayak M. Chavan et al 2019: Paper is subjected to the different types of shampoo like powder shampoo, gel shampoo, liquid shampoo, aerosol shampoo etc. and represents how the shampoo is largest segment in the global beauty market. The study describes that how important the herbal shampoo than the synthetic shampoo. Herbal shampoo is made up of different ayurvedic herbs. Ayurvedic formulations are safer than the synthetic formulation because its side effects is very low.\(^10\)

Thakkar Krunal et al 2013: The goal of this study is to formulate an evaluate herbal shampoo. The study of colour, moisture content, odor, PH of dry powders of combined form under investigation provided in importance feature of organoleptic and physicochemical evaluation. After evaluation good properties were found for the herbal shampoo, free from skin irritation and maintained its consistency even after stability storage condition.\(^11\)

Archana dhyani et al 2019: An Amla based herbal shampoo to be used as a traditional method for the cure of the hair fall/hair loss like problems. It describes that the traditional ways are also available to treat the problems in modern/new era. The shampoo is wholly prepared by using natural ingredients therefore it prevents the harm to hairs from the synthetic chemicals. It prepares the shampoo at various concentration according to the hair growth activity.\(^12\)
Pawan Maurya et al 2021: The practice of using shampoo dates back to 1500 AD when a concoction of boiled reetha (soap berries), amla (gooseberry), hibiscus, shikakai (Acacia) and other hair friendly herbs, was made and used on the scalp to healthify and cleanse the tresses. Paper itself describes about the history of medicinal herb, history of Ayurveda/Indian Ayurveda.

Shampoo helps water remove dirt, debris and odors, such as smoke or sweat effectively. Shampoo can also remove oil. (13)

D.K. Sastrawidana et al 2019: Identification and evaluation of formulated herbal shampoo includes determination of PH, determination of % solid content, Dirt dispersion test. The Ph test was performed using PH meter at room temperature with the shampoo solution in distilled water. (14)

Paschal D’souza et al 2015: From this article we have taken the information about the How India started the shampoo preparation. The very effective and first shampoo made by boiling sapindus with dried Indian gooseberry (Amla). The Guru Nanak was the one references to soap berry trees and soap in the 16th Century. (15)

Norazlina Hashim (2021) concluded that the immersion method at 100 C and Soxhlet method using ethanol produced a high percentage of oil extracts. The ethyl acetate solvent gave the same value of yield for both methods. While the Soxhlet method from the hexane solvent exhibited better results than the immersion method. While the use of distilled water gave a lower percentage of extract but still could be as an alternative if the environmentally friendly solution is considered. In a further study, the complete analysis will be done to ensure the effectiveness.
3. NEED AND OBJECTIVE

3.1. Need

The purpose of combing two or more herbs with different properties and gives different benefits to the hair. We are added the different hair product ingredient which gives multi functional use of this shampoo. It contains natural surfactant with antidandruff agent and hair growth promoter and gray hair preventing agent which are totally natural and safe for use. herbal shampoo with multipurpose are always better than chemical shampoo. There is no side effect no harm by using this multipurpose shampoo instead of marketed shampoo.

This shampoo clear dirt, nourish the hair remove the lice give cooling effect after shampooing, remove the dandruff, increase the hair volume and hair strength and it is natural condition for hair.

3.2. Objective

- 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.
- To imparting gloss to hair and to maintain their manageability and oiliness for hairs.
4. MATERIALS AND METHODS

4.1. List of material

The Herbs and powders used in present formulation work have been procured from authenticated supplier and are research grade. Some material obtained from pharmacognosy lab and some are obtained from marketed as mentioned below in table.

Table 5.1 list of materials

<table>
<thead>
<tr>
<th>Sr no.</th>
<th>Material</th>
<th>Source (from collected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neem powder</td>
<td>Cognosy lab</td>
</tr>
<tr>
<td>2</td>
<td>Hibiscus powder</td>
<td>Manakarnika Aushadhalaya Chinchwadgaon</td>
</tr>
<tr>
<td>3</td>
<td>Aloe vera</td>
<td>From market</td>
</tr>
<tr>
<td>4</td>
<td>Shikakai</td>
<td>Cognosy lab</td>
</tr>
<tr>
<td>5</td>
<td>Liquorice</td>
<td>Skay food product</td>
</tr>
<tr>
<td>6</td>
<td>Amla</td>
<td>Cognosy lab</td>
</tr>
<tr>
<td>7</td>
<td>Soapnut</td>
<td>Cognosy lab</td>
</tr>
<tr>
<td>8</td>
<td>Bringraj</td>
<td>Cognosy lab</td>
</tr>
</tbody>
</table>
5.2. List of Equipment

The Equipment and Instrument used for analysis of evaluation for APIs, excipients and formulation are listed in below table.

Table 5.2 List of Equipment

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Instrument</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Digital Weighing balance</td>
<td>DWB1000</td>
</tr>
<tr>
<td>2</td>
<td>Digital pH meter</td>
<td>EQ-610</td>
</tr>
<tr>
<td>3</td>
<td>Stalagmometer</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hot air oven</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Hot plate disc</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>viscometer</td>
<td>Brookfield viscometer</td>
</tr>
</tbody>
</table>

5.3. List of glassware

<table>
<thead>
<tr>
<th>Sr.no.</th>
<th>glassware</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Beaker</td>
</tr>
<tr>
<td>2</td>
<td>glass rod</td>
</tr>
<tr>
<td>3</td>
<td>Measuring cylinder</td>
</tr>
<tr>
<td>4</td>
<td>spatula</td>
</tr>
<tr>
<td>5</td>
<td>funnel</td>
</tr>
<tr>
<td>6</td>
<td>Conical flask</td>
</tr>
<tr>
<td>7</td>
<td>Motor &amp; pestle</td>
</tr>
</tbody>
</table>

Table 5.3 List of glassware
5.4. Methods

5.4.1. Material collection

Different plant parts with hair care properties were chosen for the study.

Amla fruits are plant (embelica officinalis)

Neem leaf, hibiscus leaf (hibiscus rosea)

Shikakai fruit (acacia)

Aloe leaf (aloe barbadensis)

Amla powder, shikakai powder and neem powder collected from college’s cognosy laboratory. Hibiscus leaf powder, reetha fruit, liquorice powder, aloe vera leaf are collected as raw material from market. all collected raw materials were given in the table

Table 5.4 Materials of Shampoo

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Constituents</th>
<th>Biological source/family</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amla powder</td>
<td>Dried ripe fruits of <em>Embelica officinalis</em> (Euphorbiaceae)</td>
<td>Darkening of hair and hair growth promoter, Moisturizing agent</td>
</tr>
<tr>
<td>2</td>
<td>Neem powder</td>
<td>Dried leaves of <em>Azadirachia indica</em> (miliaceae)</td>
<td>Antibacterial anti-fungal, antiseptic, Prevent dryness of hairs and flaking of hairs</td>
</tr>
<tr>
<td>3</td>
<td>Hibiscus powder</td>
<td>Dried leaves of <em>Hibiscus rosea</em> (malvaceae)</td>
<td>Hair conditioner, hair growth</td>
</tr>
<tr>
<td></td>
<td>Ingredient</td>
<td>Components Used</td>
<td>Benefits</td>
</tr>
<tr>
<td>---</td>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Aloe vera</td>
<td>Dried leaves of <em>Aloe barbadensis miller</em> (Asphodelaceae)</td>
<td>Anti-dandruff agent, Conditioner, moisturizing effect</td>
</tr>
<tr>
<td>5</td>
<td>Shikakai powder</td>
<td>Dried pods of <em>Acacia concina</em> (Mimosaceae)</td>
<td>Nourish the scalp, heal damage, detergent</td>
</tr>
<tr>
<td>6</td>
<td>Liquorice powder</td>
<td>Peeled and unpeeled roots, stolons, stem of <em>Glycyrrhiza glabra</em></td>
<td>For hair loss treatment and prevention of premature graying of hair</td>
</tr>
<tr>
<td>7</td>
<td>Soap nut (Ritha fruit)</td>
<td>Dried fruits of <em>sapindus mukorossi</em> (Sapindaceae)</td>
<td>Provides shining and silky hair, detergent</td>
</tr>
<tr>
<td>8</td>
<td>Bringraj</td>
<td>Extract from the root of the plant <em>Eclipta prostrata</em>. Family: Asteraceae</td>
<td>To maintain and rejuvenate hair, hair darkening, hair growth promoter</td>
</tr>
</tbody>
</table>
5.4.2. Extraction Methods

**Soupnut Extraction**

The outer pericarp of Ritha was separated from the seeds. The separated Ritha pericarp were washed with water and sun dried indoors at room temperature (20 ± 8 2) °C. & crushed with mortar and pestle. The samples were macerated for 24 hours in Millipore water at room temperature and filtered. The filtrate was evaporated in a rotary evaporator on a water bath at 40-50 °C. Ritha gave a brownish paste. The extract was weighed and dissolved in Millipore water. All measurements were performed at least thrice. (20)

**Amla extract**

Amla fruit was made seedless and chopped and kept in drier at 40 °C until properly dried and to be crushed, and 10g crushed amla powder was then mixed with 50 mL of 95% ethanol (aml powder: ethanol = 1:5, w/v) and stirred continuously to obtain the maximum solvent dissolved constituents. Filtrate was thereafter concentrated by using rotary evaporator for 20 min at 40 °C under reduced pressure followed by two times re-extraction. Concentrated amla extract, was further subjected to a hot air oven for proper drying at 45 °C for 12 h, and thereafter stored at 4 °C in the dark in an airtight glass container, until further use. (21)

**Neem extract**

The neem leaves were washed using distilled water. During the drying process, the leaves were left under sunlight for three days. Then, the leaves were ground to powder form. Two methods were implemented to extract the neem leaves.

1. In the first method, 26.0 g neem leaves powder was extracted with 300 ml methanol solvent by using Soxhlet extractor in 2 hrs. After the extraction, it was filtered and the methanol solvent was evaporated completely by using a rotary vacuum evaporator, brand BUCHI R-215 manufactured by Buchi, German. The same steps were repeated by using other solvents; ethanol, ethyl acetate, and hexane.

2. In the second method which was immersion extraction, the neem leaves powder was weight around 26.0 g and were put in a polytetrafluoroethylene (PTFE) bottle, followed
by the insertion of 300 ml methanol solvent. The bottle was tightly closed and was placed in an oven at a temperature of 100°C for 2 hrs. Furthermore, the solution was filtered and evaporated by using a rotary vacuum evaporator. All extraction methods were repeated by using ethanol, ethyl acetate, and hexane solvents. Distilled water (DW) was used as an extraction solvent at room temperature (25°C), 50°C, 70°C, and 90°C for 2 hrs in the immersion method. This purposely compares whether the distilled water has the potential to be used as a medium in extraction since it has low cost compared with other solvents (19).

Table 5.5 Formulation of Shampoo

<table>
<thead>
<tr>
<th>Sr.no</th>
<th>Compound</th>
<th>LF (%W/V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neem powder</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Hibiscus powder</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Aloe vera</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Shikakai</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>Liquorice</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Amla powder</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Soap nut</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>Bringraj</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Lemon</td>
<td>1ml</td>
</tr>
<tr>
<td>10</td>
<td>Water</td>
<td>Q.S.</td>
</tr>
</tbody>
</table>

5.4.3. Preparation of shampoo Method

1. Weigh the all powder as per requirements giver in table by weighing balance.

2. Aloe vera gel preparation: Wash aloe vera leaf with clean water then cut the leaf and collect the transparent white part into water in beaker. Remove it from water weigh it then use it for preparation of shampoo.

3. Weighted soapnut, shikakai & amla boiled separately in 40 ml on water bath for 5 min to get liquid extract of this powders. After boiling filter it

4. Filter it separately

5. Mix the amla extract and shikakai extract in mortarpestle.
6. Add other weighted powders in it triturate it properly
7. Add weigh aloe vera and triturate it in mortarpestle for proper mixing
8. Add the reetha extract in the above mixture.
9. Measure the quantity and make up volume 100ml by adding water as per q.s.
10. Evaluate the prepared shampoo and take reading and compare with other marketed shampoo
6. INGREDIENT OF SHAMPOO

6.1. Aloe Vera

Aloe Vera It is a succulent plant of the genus aloe, it is widely distributed, and is considered an invasive species in many world regions. An evergreen perennial, it originates from the Arabian Peninsula, but grows wild in tropical, semi tropical and arid climates around the world. It can grow up to 30 to 50 cm long and have 10 cm width at the base.\(^{(7)}\)

Terms:

Aloe Vera is derived from the Arabic word 'Alloeh', meaning a 'shining bitter substance' and Vera came from the Latin word 'Vera' meaning 'true'.

Benefits:

- It calms an itchy scalp.
- Deep cleanses the oily hair.
- Strengthens and repairs hair strands.
- May promote hair growth.

Aloe Vera is a perennial, drought-resistant succulent plant in the Asphodelaceae family. The name aloe is derived from the Arabic "alloeh" or Hebrew "halal," both of which mean bitter shiny substance. It plays an important traditional role in indigenous systems of medicine such as Ayurveda, siddha, Unani, and homeopathy. One of the 250 Aloe species is Aloe barbadensis miller or Aloe Vera, a semi-tropical plant. Aloe Vera, also known as "Ghee
kunwar" in Sanskrit, is a member of the Lily family and is most commonly used for its medicinal properties. The plant's leaves are lance-shaped, sharply pointed, and jagged and edged. Aloe Vera grows wild along the coast of south India. It is grown on a large scale in many parts of India, including Tamil Nadu.

Aloe barbadensis contains over 200 compounds, approximately 75 of which have biological activity. Aloe Vera leaves contain a diverse array of compounds, including anthraquinones (e.g. aloe-emodin), anthrones and their glycosides (e.g. 10-(1, 5’-anhydroglucosyl)-aloemodin-9-anthrone, also known as aloin A and B), chromones, carbohydrates, Aloe vera has a variety of applications, the most common of which are as a food preservative and medicine. Aloe can be found commercially in pills, sprays, ointments, lotions, liquids, drinks, jellies, and creams [8]. Numerous aloe species are used to treat conditions ranging from dermatitis to cancer [9]. Several studies have revealed that Aloe vera leaf has a wide range of pharmaceutical properties, including antimicrobial, anticancer, and anti-inflammatory properties [8].

Historical context

The Aloe plant and its derivatives have been used in medicine and health care since the 4th century B.C., when ancient Greek doctors obtained aloe from the island of Socotra is located in the Indian Ocean. There are also numerous romantic stories about it, implying that Egyptian Queens Nefertiti (1353 BCE) advertised as "the most beautiful woman who ever lived" and Cleopatra VII (69-30 BCE) used it as part of their regular advertising Medicines and beauty regimens According to legend, Alexander the Great Aristotle, his mentor, persuaded him to capture the in 333 B.C. The Indian Ocean island of Socotra is famous for its Aloe supplies. He required medical attention for his wounded soldiers. The historic Nile Valley Kemet's civilization ("Land of the Blacks") is now known as Later, the name Egypt was derived from the Greek name Aigyptos. Aegyptus was Latinized under Roman rule and derived from the name "Hekapthah," which means "Lands of Ptah's Temple") Aloe was used in medical treatments, cosmetics, and embalming.

Aloe's medicinal use was first mentioned more than 4000 years ago in a collection of Sumerian clay tablets dating from 2100 BC. In the Egyptian Papyrus Ebers from 1552 BC, aloe was also mentioned as a laxative. Aloe has a long history of use as a strong laxative for chronic constipation, and it is still listed as such in many pharmacopoeias. It has, however, been largely replaced by less toxic laxatives. The Aloe plant's original commercial use was in the production of Alcin, a yellow sap used for many years as a laxative ingredient. During the early 1900s,
this product became synonymous with the name "Aloe" and was documented in trade, technical, and government literature. Bill C. Coates, a practising pharmacist in Dallas, Texas, USA, became a man with a dream in 1964: to make the full benefits of Aloe Vera available to the world. There are millions of people who require it. Persuaded that the plant's "Gel" could be extracted and used without losing its effectiveness, Coates, Dr. devoted himself to learning the chemistry of the plant—and to accomplish what no one had ever done before in the plant's history 4100 years of known history – extraction and natural stabilization the "Gel" while retaining its natural healing properties; and He was successful in 1968. Since then, new opportunities for the use of stabilized Aloe Vera gel in medicine, sports, and health as well as cosmetics

**cultivation of aloe vera**

Aloes have thick, tapered, green, spiny leaves that grow from a short stalk near the ground. Aloe is related to other members of the family. Onions, leeks, garlic, tulips, turnips, and other members of the lily family asparagus. Despite the fact that Aloe is native to North Africa and Spain, Plants are now grown in hot, dry regions of Asia and Europe as well as America. Without water, an aloe plant can live for more than 7 years. It gets the water it needs to survive and grow by collecting dew on the surface of its leaves. It repels insects, rodents, and snakes by using the bitter Aloin (the yellow colored part of the sap) just beneath the rind. It is a perennial plant that can reach a height of 112 - 212 feet. Its leaves are long and thick, juicy, and phytolaxy-like. The leaves have a thorny structure on both sides, with a thorny tip. The inner substance of the leaves is jelly-like, has a bad dour, and tastes bitter. (28)

**Anatomy of aloe Vera**

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers, and seeds in abundance. Each leaf is made up of three layers: 1) A clear inner gel made up of 99 percent water and the rest of glucomannans, amino acids, lipids, sterols, and vitamins. 2) The bitter yellow sap in the middle layer of latex, which contains anthraquinones and glycosides. 3) The rind is an outer thick layer of 15–20 cells that serves as a protective layer and synthesizes carbohydrates and proteins. Inside the rind are vascular bundles that transport substances such as water (xylem) and starch (phloem). (29)
Active constituents of aloe vera

Aloe vera contains 75 potentially active constituents, including vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids. 4–6

Vitamins: It contains antioxidant vitamins A (beta-carotene), C, and E. It also includes B12, folic acid, and choline. Free radicals are neutralized by antioxidants.

Enzymes: There are eight enzymes in it: aliase, alkaline phosphatase, amyrase, brady kinase, carboxypeptidase, catalase, cellulase, lipase, and peroxidase. When applied topically to the skin, brady kinase helps to reduce excessive inflammation, while others aid in the breakdown of sugars and fats.

Minerals: Calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium, and zinc are all present. They are required for the proper operation of various enzyme systems in various metabolic pathways, and a few are antioxidants.

Sugars: It contains monosaccharides (glucose and fructose) as well as polysaccharides (glucomannans/polymannose). These are known as mucopolysaccharides and are derived from the plant's mucilage layer. Mannose-6-phosphate is the most common monosaccharide, and glucomannans [beta-(1,4)-acetylated mannan] are the most common
polysaccharides. Acemannan, a well-known glucomannan, was also discovered. Aloe vera gel has recently yielded a glycoprotein with antiallergic properties known as alprogen, as well as a novel anti-inflammatory compound known as C-glucosyl chromone.

**Anthraquinones:** It contains 12 anthraquinones, which are phenolic compounds that have traditionally been used as laxatives. Aloin and emodin have analgesic, antibacterial, and antiviral properties.

It contains four plant steroids: cholesterol, campesterol, -sisosterol, and lupeol. All of these have anti-inflammatory properties, and lupeol has antiseptic and analgesic properties as well.

**Hormones:** Hormones include auxins and gibberellins, which aid in wound healing and have anti-inflammatory properties.

**Others:** It contains 20 of the 22 amino acids required by humans and 7 of the 8 essential amino acids. It also has salicylic acid, which has anti-inflammatory and antibacterial properties. When lignin, an inert substance, is included in topical preparations, it improves the penetration of the other ingredients into the skin. Saponins, which are soapy substances that make up about 3% of the gel, have cleansing and moisturising properties. (23)

**Storage:** Aloe vera juice is stored in amber-colored glass bottles to protect the sensitive bioactive agents from light. The two most important environmental parameters that influence product quality are relative humidity and temperature. These two parameters can also influence how much of the juice's volatile substance is absorbed by the body. The packaging material and, as a result, the product's shelf life (30)

**Medicinal uses of aloe vera**

Aloe Vera’s medicinal properties range from external burn treatments to consumption-based constipation relief. Aloe vera is the most effective natural plant used both externally and internally, and it provides numerous benefits. Aloe Vera’s health benefits have been reported widely around the world. Aloe vera has two parts that are commonly used. The bitter exudate is widely used as a bittering agent in alcoholic beverages and as a laxative and is used as a natural drug for its cathartic effect. The dried latex is a strong laxative with a high barbaloin content, but its use should be limited to no more than one week, and it should not be used during menstruation, pregnancy, or nursing. The medicinal use of Aloe
vera is based on historical and traditional use, as well as an examination of modern pharmacological and toxicological research. The inner gel, also known as "pure gel," is the more well-known part of the Aloe vera plant. This is the most vulnerable part of the plant. (28)

6.2. Bhringraj

Bhringraj (Eclipta alba Linn.) Bhringraj (Eclipta alba Linn, Family- Asteraceae) is an annual or perennial plant found in moist places throughout India, ascending up to 600 fts. Bhringraj mainly contains coumestans (wedelolactone and dimethyl wedelolactone), alkaloid (ecliptine), glycosides (β-amyrin), triterpenic acid and steroids (ecalbasaponins). Brahmi oil is very good hair tonic and used as a constituent in hair formulation for healthy, black and long hair (16)

![Bhringraj](image)

**Fig 6.2 Bhringraj**

**Benefits of Bhringaraj**

**Promotes Hair Growth and Cures Baldness**

Bhringaraj plays a pivotal role in treating and preventing baldness. It effectively increases blood circulation in the scalp and hair follicles, which in turn enriches the roots by bringing in more nutrients through the blood supply and promote hair growth. Sesame oil nourishes the hair while Ayurveda vouches that regular use of bhringaraj oil provides effective results by activating the hair follicles.

**Treats Dandruff and Scalp Itchiness**
Various types of dandruff usually occur due to excessive dry scalp, humidity in the air and lack of hygiene and eventually leads to itching and flaking. Bhringaraj oil not only has powerful anti-microbial, anti-bacterial properties but also has a high specific gravity, which allows the oil to penetrate deep inside the scalp and treat dry scalp and itching.

**Reduces Hair Fall**

Bhringaraj oil is the one-stop solution for hair fall. It effectively reduces Vata and Kaphs doshas, cools the scalp and reduces the stress levels which are primarily the most predominant causes of hair fall. It provides nourishment to hair follicles, increases blood circulation in the scalp, prevents dryness of scalp and hence reduces hair fall.

**Stops Premature Greying of Hair**

The active constituents of bhringaraj hair oil contain haritaki and Jatamansi which are extremely beneficial in maintaining the natural colour of hair and prevent premature greying. Henna prepared with the leaves of bhringaraj is also helpful in dyeing the hair. Regular use of bhringaraj oil plays a key role in slowing reducing grey hairs and preventing further in the future.

**Treats Scalp Infections**

The goodness of anti-bacterial properties in bhringaraj, make it a prompt solution for treating a variety of scalp infections. Majorly bhringaraj oil is effective in treating different forms of folliculitis, which occurs due to the infection from Staphylococcus aureus and causes inflammation of the hair follicles which ultimately leads to hair fall and balding. It also treats a ringworm infection on the scalp due to Tinea capitis. Regular use of this magical oil reduces inflammation of the hair follicles, scalp tenderness, alleviates scalp itching and increases hair growth.

**The Ayurvedic Perspective:** According to the Ayurvedic tradition, bhringaraj is a cooling herb that promotes hair growth. Bhringraj oil and other extracts have a long history of use on the subcontinent, especially as a hair treatment to reduce hair fall or encourage hair regrowth. The herb also helps to delay greying of hair and helps balance all the doshas. Most importantly, it helps to lower pitta. As excess pitta is a major cause for hair damage and balding, this is what makes bhringaraj so effective.
6.3 Neem

Order- rutas

Suborder-rutinae

Family-meliaceae

Subfamily-melioideae

Tribe-melieae

Genus-azadirachata

Species-indica

fig 6.3 Neem

Neem fruit, seeds, leaves, stems, and bark contain diverse phytochemicals, some of which were first discovered in azadirachta seed extracts, such as azadirachtin established in the 1960s as an insect antifeedant, growth disruptor, and insecticide.\textsuperscript{[1]}\textsuperscript{[12]} The yield of azadirachtin from crushing 2 kg of seeds is about 5 g.\textsuperscript{[11]}

In addition to azadirachtin and related limonoids, the seed oil contains glycerides, diverse polyphenols, nimbolide, triterpenes, and beta-sitosterol.\textsuperscript{[11]}\textsuperscript{[13]} The yellow, bitter oil has a garlic-like odor and contains about 2% of limonoid compounds.\textsuperscript{[11]} The leaves contain quercetin, catechins, carotenes, and vitamin C.

Neem (Azadirachta indica) Neem (Azadirachta indica, Family- Meliaceae) is indigenous to all plains in Indian subcontinent. It also grows widely in the sub-Himalayan track at altitude of 700–10,000 m above sea level. Neem leaves contain flavonoids, steroids, terpenoids, sterols and nimboide. Neem seed and seed oil contain different bitter limonoids including nimbin, nimbinbin, salanin etc. many commercial shampoos contain neem oil for the control of ticks, fleas and lice. In European countries neem oil also used in different herbal hair oil, hair tonic and conditioners.\textsuperscript{[16]}

Azadirachta indica A. Juss (neem) is one of these plants and has been used for more than 2000 years in India and neighboring countries. As proven scientifically, it has a wide spectrum of
biological activity and classified in one of the most versatile plants [1]. All parts of the tree, from seeds, flowers, twigs, barks, roots and leaves have their medicinal potential to humans. Part of it, the leaves of the neem tree are traditionally used in medicinal preparations purposely for anti-inflammatory, antibacterial, antiviral, antioxidant hepatoprotective and others [2,3],[4]. Neem seed has the most oil content among the parts of the neem tree. It contains around 45% oil including oleic acid, linoleic acid, palmitic acid, stearic acid and arachidic acid [5]. This seed is functional as anti-malarial, antipyretic, and antifungal (19).

6.4. shikakai

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Rosids
Order: Fabales
Family: Fabaceae
Subfamily: Caesalpinioideae
Clade: Mimosoid clade
Genus: Senegalia
Species: S. rugata

fig 6.4 shikakai

Shikakai which means “fruit for hair” is a part of the traditional Indian Ayurvedic medicine. It is an herb especially used for controlling hair fall and dandruff. Shikakai can be used alone or in combination with reetha and amla as a shampoo to help manage hair fall and prevent dandruff due to its cleansing and antifungal properties. It provides shine to the hair as well as prevents its greying. According to Ayurveda, applying Shikakai powder along with rose water or honey to wounds helps in faster healing due to its Ropan (healing) property and Sita (cold) nature. Drinking Shikakai infusion helps manage constipation due to its Rechana (laxative) nature. It is also beneficial for bleeding piles due to its Kashaya (astringent) property.
Benefits of shikakai

1. Hair loss
Shikakai is one of the most useful Ayurvedic herbs that is used for hair related problems especially hair fall. Shikakai helps to remove dirt and excess oil from the scalp as well as promote hair growth. This is because of its Kashaya (astringent) property.

2. Anti-dandruff
Shikakai is useful as an anti-dandruff agent because of its unique ability to cleanse without irritating the scalp. It is especially useful for controlling chronic dandruff which is due to excessive oil on the scalp. Applying Shikakai helps to remove excess oil from the scalp and controls dandruff when used regularly.

3. Wound healing
Shikakai helps in quick healing of the wound, decreases swelling and brings back the normal texture of the skin. This is due to its Ropan (healing) property. Shikakai also helps to reduce inflammation and burning sensation when applied to the wound. This is because of its Sita (cold) nature.

Shikakai, scientific name Acacia concinna, is a saponin-rich plant, belongs to the Leguminosae family (subfamily Mimoseae). This particular plant is abundant in both the eastern and southern parts of India. Saponin, a surface-active component of its fruit, is found in the pericarps. a complex mixture of saccharine derivatives and a member of the Non-ionic surfactant that occurs naturally. Saponins derived from Acacia Concinna is an acacia acid triglyceride [15,16] containing glucose, arabinose and xylene are sugar moiety (called glycoen) that are linked to the acetic acid moiety via oxygen (called aglycone), Saponin is naturally amphiphilic due to the presence of both polar (Glycone part) and non-polar (Aglycone part). As a result, it can dissolve the organic compound in water. As a result, aqueous saponin solution can be used as a suitable substitute for organic solvent. (22)

Senegalia rugata has been used for hair care in the Indian Subcontinent since ancient times. It is an Ayurvedic medicinal plant. It is traditionally used as a shampoo and is also found in synthetic Ayurvedic shampoos. It is commonly known as shikakai, which is derived from the Tamil word cikaikky (cikai 'hair' + ky 'fruit'). To make it, the plant's fruit pods, leaves, and bark are dried, ground into a powder, and then mixed into a paste. While this traditional shampoo does not produce the amount of lather that a sulfate-containing shampoo would, it is considered a good cleanser. It is gentle, with a naturally low pH, and does not strip hair of natural oils.
Extracts of Senagalia rugata are used in natural shampoos and hair powders, and the tree is now grown commercially in India and Southeast Asia. [18] The bark, leaves, or pods of plants are used to make the dry powder or extract. Saponins, which are foaming agents found in several other plant species and used in shampoos and soaps, are abundant in the bark. Saponin-containing plants have long been used as gentle cleaning agents. Saponins from the plant's pods have traditionally been used as a detergent and for poisoning fish in Bengal; they have been shown to be potent marine toxins.

**chemical constituents**

The fruit of the tree contains alkaloids. When the plant is hydrolyzed in commercial extracts, it produces lupeol, spinasterol, acacie acid, lactone, and the natural sugars glucose, arabinose, and rhamnose. It also contains the alkaloids caleyctomine and nicotine, as well as hexacosanol, spinasterone, oxalic acid, tartaric acid, citric acid, succinic acid, and ascorbic acid.

### 6.5. Amla

Phylum- Plant Kingdom

Class – Dicotyledons

Order – Euphorbia

Family – Euphorbiaceae

Genus – Emblica

Species – E. officinalis

Indian names: amalkamun, uririkai (Andhra Pradesh); amlaki, amhuki (Assam); amla, amloki (Bengal); amali, ambala (Gujrat); amla, aonla (Himachal Pradesh); amla, aonla, onilika (Hindi); amalaka, nelli (Kamata); nelli (Kerala); alathanda, khondana, anola (Orissa), aonla (Punjab); adipaha, dhatri, amalaka, shriphala, vritophala (Sanskrit); nelli (Tamilnadu)

**Chemical constituents**

1 Tanins 2 Alkaloids 3 Phenolic compounds 4 Amino acids 5 Carbohydrates 6 Vitamin C 7 Flavanoids 8 Ellagic acid 9 Chebulinic acid 10 Quercetin 11 Chebulagic acid 12 Emblicanin-
A 13 Gallic acid 14 Emblicanin-B 15 Punigluconin 16 Pedunculagin 17 Citric acid 18 Ellagotannin 19 Trigallayl glucose 20 Pectin

Health benefit

Pharmacological research has reported various efficacious properties of amla fruit with regard to prevention and treatment of several non-communicable diseases like cardiovascular diseases, metabolic syndrome, cancer, gastrointestinal disorders, deficiency diseases, and hepatic diseases and disorders. However, these properties with reference to amla oil have not been studied and data pertaining to the pharmacological properties of amla oil are scanty. However, amla oil has been used for centuries in Ayurvedic medicine for its wide range of beneficial applications in hair nourishment and healthy scalp. The efficacy of amla oil for nourishing the scalp, conditioning dry and brittle hair and for promoting strong, healthy and shiny hair has been supported by the researchers. Researchers recognized amla oil as a powerful inhibitor of 5α-reductase. The medication finasteride, used to treat male baldness, also works by inhibiting 5α-reductase. These exceptional properties have captivated the interest of manufacturers to this ancient oil for its effective incorporation into shampoos, scalp treatments and other hair and scalp formulations. Furthermore, amla has also been investigated for its antibacterial and antimicrobial potencies. Antimicrobial resistance is a public health concern at the global level. In developing countries, community-based data has revealed an increase in the burden of antimicrobial resistance. The most common antimicrobial resistance bacteria are Staphylococcus aureus found in the environment affecting about 20% of the human populations who become long-term carriers of S. aureus. Thereby, powerful antibiotics are needed to destroy these bacteria, which do not cause any life-threatening complications (Sievert et al. 2002). However, a continuous spread of multi-drug resistant pathogens has become a serious threat to public health. Therefore, the discovery of new antimicrobial agents of plant origin which can cure these problems naturally is of utmost importance. Few studies have proven the antibacterial activity of Emblica officinalis essential oil, which is used for the treatment of Staphylococcus aureus causing diseases. For instance, Saxena and Patil (2014) have revealed that methanol solvent fruit extract of Emblica officinalis essential oil exhibits a strong inhibitory effect against S. aureus compared to the other solvents extracts of essential and positive control Gentamicin. there is an enormous scope for more extensive research to explore and evident the pharmacological aspects of amla oil using modern technologies. In addition, there is need to incorporate the proven medicinal implications of this fruit oil in the food industry as data pertaining to its utilization in various edible formulations is insufficient. (33)
6.6. soupnut

Family- sapindaceae
Kingdom- plantae
Division- magnoliophyte
Class- magnoliopsida
Subclass- rosidae
Order- Sapindales
Genus- sapindus

Fig 6.6 soupnut

Sapindus mukorossi, also known as soapnut, is a member of the Sapindaceae family. It is a popular ingredient in ayurvedic preparations such as shampoo, cleansers, and medicine for the treatment of eczema, psoriasis, and freckle removal. It also has gentle insecticidal properties and is traditionally used for lice removal from the scalp. The species is widely cultivated in the upper Indo-Gangetic plains, Shivalik and sub-Himalayan tracts at altitudes ranging from 200 to 1500 metres. It is also known as Soapnut. Aritha tree is one of the most valuable trees in Asia's tropical and subtropical regions. (27)

Sapindus mukorossi, also known as 'soapnut' or 'aritha,' belongs to the Sapindaceae family. It is used in medicine as an expectorant, contraceptive, and to treat excessive salivation, epilepsy, chlorosis, and migraine. It is also a popular ingredient in ayurvedic preparations such as shampoo, cleansers, and medicine for the treatment of eczema, psoriasis, and freckle removal. It also has moderate insecticidal properties and is traditionally used to remove lice from the scalp. (27)

History of soapnut

Sapindus mukorossi is an ancient fruit, with some claiming it originated in China and others in India. Soapberries are mentioned in ancient Indian texts. According to the book "Saint Heritage of India," Hatha yoga Founder Machindranath was converted under a soapnut tree sometime between the 9th and 10th centuries. According to the "Chronological Dictionary of Prehistoric
India," the paper title "Some Notes on the History of Soapnut, Soap, and Washermen of India—between 300 BC and AD 1900" suggests even earlier roots (27)

Soapnuts and other saponin-rich plant materials are known for their phytochemistry and pharmacology. After a gap of two decades, there has been a sudden spate in research on soapnuts with experiments on a wide range of applications. There are twelve soapnut species present globally, examples of three are: *Sapindus mukorossi*, *S. trifoliatus* syn *laurifolia*, and *S. emarginatus*. The saponin content varies among the three species, making it difficult to ascertain the critical micelle concentration (CMC), an important functional aspect. Recent research in applications includes surfactants in industry, laundry, bioremediation, biopesticide, poultry feed supplement, biodiesel, biochar, and pharmacology. As an alternative to laundry detergent, soapnut works best at CMC. The ecological services of the tree are restricted to terrestrial ecosystems, while the fruit is toxic to aquatic animals. More research is needed to establish the permissible limits for soapnut saponins in wastewater and their biodegradability before soapnuts can be accepted as a bio-based surfactant. Nevertheless, research indicates that it will be beneficial to propagate soapnuts as a sustainable supplement to petroleum-based surfactants and fuels. With many by-products from soapnuts, it is possible to attain zero wastage. Propagation techniques, including natural regeneration, selective crop breeding, vegetative propagation, and tissue culture, have been explored to promote high-quality crops. Planting the appropriate variety of soapnuts could provide a sustainable agroforestry crop that is resilient to climate change.
6.7. Hibiscus powder

Kingdom: Plantae
Clade: Tracheophytes
Order: Malvales
Family: Malvaceae
Subfamily: Malvoideae
Tribe: Hibisceae
Genus: Hibiscus

Fig 6.7 hibiscus powder

There are still many ongoing studies done to discover plants that can act as medicine and use in cosmetic products. One such plant is Hibiscus rosa-sinensis Linn (HRS). It is well accepted that the whole part of HRS such as stem, roots, flower, and leaves had been used as traditional and folklore medicine. The flowers usually used in herbal teas and food coloring and in some countries, they are eaten as salad or pickles proven. This shows that this plant is not harmful and safe to our bodies. The leaves have been used in healing processes due to their antioxidant, antityrosinase, and anti-bacterial activities [8, 9]. It’s usage as traditional medicine is, however, still limited and warrants further studies. In addition, there are only a few articles on hair growth that uses HRS as an activating agent and the rest are about the anti-bacterial activity. Drugs are an option to cure hair loss, but fear of side effects cannot be ignored. An option which is using an herbal remedy to cure this disease has yet to be incorporated into the mainstream of medical care due to limited scientific evidence. Hence, it is believed that HRS provides an alternative as a herbal remedy that can be used to promote hair loss based on traditional practices. With that, in the present study, Hibiscus rosa-sinensis Linn (HRS) is used as an activating ingredient to promote hair growth.
The herb Hibiscus rosa-sinensis Linn. (Malvaceae) is a glabrous shrub widely cultivated in the tropics as an ornamental plant and has several forms with varying colours of flowers. In medicine, however, the red flowered variety is preferred. The leaves and flowers are observed to be promoters of hair growth and aid in healing of ulcers. Flowers have been found to be effective in the treatment of arterial hypertension and to have significant antifertility effect. According to traditional texts (Nadkarni, 1954; Kumar et al., 1994), it is well accepted that the leaves and flowers of Hibiscus rosa-sinensis have hair growth promoting and anti-greying properties. Moreover, in India the herbal products in the market intended for hair growth include the extract of various parts of Hibiscus rosa-sinensis. (34)

Benefits for hair

- hair growth
- thick, healthy, lustrous hair appearance
- premature graying prevention
- dandruff abatement
- stop hair loss
- make your hair look healthy and lustrous
- prevent premature graying
- thicken hair and add volume
- treat dandruff
- condition against frizz, dryness, and breakage
- prevent split end

6.8. Liquorice

Liquorice powder promotes blood circulation in the scalp and nourishes the roots by supplying vital nutrients to the hair follicles. This helps arrest hair fall as well as condition the hair, adding a healthy shine to it.

Mulethi or liquorice powder has a lot of benefits for the body, skin and hair. It is widely used in Ayurveda to treat a number of issues. Some of the common
problems this powder helps with are sore throat, indigestion, weight loss, scalp infections and skin problems.

![Liquorice](image)

**Fig 6.8 liquorice**

**Benefits for hair**

**Prevents hair fall**
If you are facing **hair fall issues** and looking for a natural remedy, mulethi could be the answer. Liquorice powder promotes blood circulation in the scalp and nourishes the roots by supplying vital nutrients to the hair follicles. This helps arrest hair fall as well as condition the hair, adding a healthy shine to it.

**Cures dandruff**
Dandruff can be quite bothersome, especially if it falls like flakes on your shoulders. This problem can be cured with the use of this Ayurvedic ingredient. The antibacterial properties in mulethi powder curbs dandruff and other scalp infections that cause itching on the scalp.

**Promotes hair growth**
If you feel like your hair growth has become stagnant, you are not alone. It could be a result of stress, poor hair care habits or an unhealthy diet. But if you can get your hands on mulethi powder, there’s no harm in using it to promote blood and oxygen supply to the hair, which helps **promote hair growth**.

**Prevents premature greying.**
7. Evaluation of Herbal Shampoo

To evaluate the prepared formulations quality control tests including visual assessment and physicochemical controls such as pH 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 tests were carried out. The results were compared with marketed formulations.

7.1. Physical appearance / visual assessment

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

7.2. Solubility

Two ml of the shampoo is added to 100 ml of water. The solution formed was well shaken and then heated to increase solubility. After 10 mins of heating the solution was cooled down and then the quantity of residue was noted. (18)

7.3. 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. (4)

7.4 Determination of pH

The pH of shampoo solution in distilled water was determined at room temperature by using pH paper.

7.5. Determine percent of solids contents

A clean, dry evaporating dish was weighed and added 4 grams of herbal shampoo to the evaporating dish. 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.

7.6. Test to evaluate foaming ability and foam stability

Foaming ability was determined by using cylinder shake method. Briefly, 50 mL of the 1% commercial or formulated shampoo solution was placed into a 250 mL graduated cylinder; it
was covered with one hand and shaken 10 times. The total volume of the foam content after 1 min of shaking was recorded. Foam stability was evaluated by recording the foam volume after 1 min and min of shake test

7.7. Rheological evaluation

The viscosity of the shampoo was calculated by using viscometer. The viscosity of the shampoos was measured with the temperature and sample containers size was kept constants during the study.

7.8. Dirt dispersion

Two drops of shampoo were added in large test tube contain 10 ml of distilled water. One drop of ink was added in the test tube, was stopped and shake for ten times. The amount of ink in the foam was estimated as none, light, moderate or heavy.

7.9. Skin sensitization test

This test is performed on skin of human volunteers and checks whether its irritation on skin or not. 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. The animals of group I was served as normal, without any treatment. Animal Group II, III, IV, V and VI were applied with shampoo formulation F1, F2, F3, MS1 and MS2 respectively. 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 Group VII. 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.

7.10. Testing of wetting

Wetting time was calculated by noting the time required by the canvas paper to sink completely. A canvas paper weighing 0.44 g was cut into a disc of diameter measuring 1-inch. Over the shampoo (1% v/v) surface, the canvas paper disc was kept and the time taken for the paper to sink was measured using the stopwatch.
7.11. Cleaning Action

Cleaning action was tested on wool yarn in grease. Although cleaning or soil/sebum removal is the primary aim of a shampoo, experimental detergency evaluation has been difficult to standardize, as there is no real agreement on a standard soil, a reproducible soiling process or the amount of soil a shampoo should ideally remove. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos. The results of detergency studies showed that the final formulation has significantly similar detergency ability, when compared with the marketed formulations and it was found in between 18-33%. The results are presented in Table

7.12. Surface tension measurement: Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water. Because surface tension is highly affected with grease or other lubricants5, 6. The data calculated by following equation given bellow:

\[ R_2 = \frac{(W_3-W_1)n_1}{(W_2-W_1)n_2} X R_1 \]

where \( W_1 \) is weight of empty beaker. \( W_2 \) is weight of beaker with distilled water. \( W_3 \) is Weight of beaker with shampoo solution. \( n_1 \) is no. of drops of distilled water. \( n_2 \) is no. of drops of shampoo solution. \( R_1 \) is surface tension of distilled water at room temperature. \( R_2 \) is surface tension of shampoo solution.
8. RESULT

Herbal shampoo formulation

The shampoo was formulated by admixing the equal amount of the aqueous extracts of all the ingredients with soapnut (Table 8.1). The above plant extract contains phytoconstituents like saponins which is a natural surfactant having detergent property and foaming property. An ideal shampoo must have adequate viscosity and many natural substances possess good viscosity. Lemon juice (1 ml) added to the shampoo serves as anti-dandruff agent, natural antioxidant, and chelating agent and maintains the acidic pH in the formulation.

Evaluation of formulated shampoo

Comparative effectiveness of the formulated herbal and commercial shampoo were evaluated by performing some simple physicochemical tests, results of which are discussed below.

Physical appearance

The prepared shampoo showed good characteristics in terms of foaming effect and appearance on the visual inspection of the formulation. The results are shown in Table

![Fig.8.1 formulated shampoo](image)

Solubility

Shampoo sample is soluble in water small heat make it soluble, it is important to make the ingredient soluble in water for its better action. 2min heat make it completely soluble.
pH

The pH of the prepared solution of shampoo using distilled water (10%) was evaluated at 25°C temperature. For enhancing and improving the hair quality, pH of the shampoo is very important and also for stabilizing the scalp and minimizing irritation to the eyes [18]. For minimizing the damage of hair using shampoo, one of the ways in the present trend is to develop shampoos having lower pH value. Lowering of pH (mild acidity) promotes tightening of the scales and prevents swelling, thereby producing sheen. The results are presented in Table

![pH meter](image)

**Fig8.2 pH meter**

**Solid content**

Shampoo with high solid content will be very difficult to rinse and hard to work with the hair. The prepared shampoo contains 23.25% of solid content. Thus, they considered easy to wash out when having less solid content during preparation of shampoos (Table)

**Foaming ability and foaming stability**

![Foaming](image)
Fig 8.2 foaming ability test

From the consumer point of view, foam stability is one of the important needs of a shampoo. Important parameter that was considered in the shampoo evaluation was determination of foaming stability. The foam volume produced by the formulated shampoo is above 50 ml. The prepared shampoo generates uniform, small sized, compact, denser, and stable foam. 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 both shikakai and soapnut.

Table 8.1 foaming ability of shampoo

<table>
<thead>
<tr>
<th>Time in minutes</th>
<th>Formulated shampoo</th>
<th>Marked shampoo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>130</td>
<td>143</td>
</tr>
<tr>
<td>2</td>
<td>127</td>
<td>140</td>
</tr>
<tr>
<td>3</td>
<td>124</td>
<td>134</td>
</tr>
<tr>
<td>4</td>
<td>121</td>
<td>132</td>
</tr>
<tr>
<td>5</td>
<td>119</td>
<td>129</td>
</tr>
</tbody>
</table>

Viscosity

Viscosity of shampoo measured by viscometer. Viscosity of shampoo is important for its better action and storage purposes and viscosity of shampoo mentioned in table.

Dirt dispersion test

In the dirt dispersion test using Indian ink, the volume of ink in the froth was measured and the result was graded as none, light, moderate, or heavy.

Skin sensitivity

Our shampoo does not show any sensitivity reaction after applying to the skin. It is not harmful it does not show any reaction after applying.
Wet time

To test the efficacy of the shampoo, wetting ability of a surfactant needs to be calculated which depends on the concentration of surfactant [19]. For the evaluation of wetting ability of the shampoo, canvas disc method is used which is an efficient, quick, easy, and reliable method. The prepared shampoo shows the wetting time of the about 120 s. The maximum of wetting time shows that the shampoo contains lower amount of detergent.

Table 8.2 Physicochemical study of herbal shampoo

<table>
<thead>
<tr>
<th>Evaluation test</th>
<th>Formulated shampoo</th>
<th>Marketed shampoo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Dark Brown</td>
<td>Gray</td>
</tr>
<tr>
<td>Transparency</td>
<td>Not transparent</td>
<td>transparent</td>
</tr>
<tr>
<td>dour</td>
<td>Good</td>
<td>good</td>
</tr>
<tr>
<td>Ph of 10% solution</td>
<td>4.2</td>
<td>5.4</td>
</tr>
<tr>
<td>Solid contents (%)</td>
<td>25.67</td>
<td>25.00</td>
</tr>
<tr>
<td>Foam volume (ml)</td>
<td>143</td>
<td>150</td>
</tr>
<tr>
<td>Foam type</td>
<td>Dense large</td>
<td>Dense small</td>
</tr>
<tr>
<td>Surface tension (dynes/cm)</td>
<td>26.32</td>
<td>24.75</td>
</tr>
<tr>
<td>Wetting time(min)</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Cleansing action (%)</td>
<td>33.34</td>
<td>32.17</td>
</tr>
<tr>
<td>viscosity</td>
<td>142</td>
<td>148</td>
</tr>
</tbody>
</table>

Net content

Before starting the experiment, outside of the bottle was marked at the surface level of liquid, and then at the end of the experiment, the volume of water required to fill it up to the mark was noted. If the formulated materials are paste or solid forms, then the materials were placed in an open can with the frozen material taking the weight of the container and the net content was noted.
9. CONCLUSION

The aim of this study was to formulate a completely herbal shampoo which is at par with the synthetic shampoo available in the market. We formulated a herbal shampoo by using plant extracts which are commonly used traditionally and lauded for their hair cleansing actions across Asia. All the ingredients used to formulate shampoo are safer than silicones and polyquaterniums synthetic conditioning agents and vis a vis can greatly reduce the hair or protein loss during combing. Instead of using cationic conditioners we have used Sheekakai, Amla and other plant extracts to provide the conditioning effects.

Several tests were performed to evaluate and compare the physicochemical properties of both prepared and marketed shampoos. Our prepared shampoo showed comparable result with that of marketed shampoo for quality control tests but further research and development is required to improve its overall quality.
10. REFERENCES


