



FORMULATION DEVELOPMENT AND EVALUATION OF HERBAL SHAMPOO WITH ANTI-DANDRUFF ACTIVITY

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ABSTRACT:

Herbal shampoos have emerged as a promising alternative to synthetic hair care products due to their natural origin, reduced side effects, and potential therapeutic benefits. This study explores the formulation, evaluation, and effectiveness of an herbal shampoo prepared using plant-based ingredients known for their cleansing, conditioning, and medicinal properties. The key components include extracts from *Azadirachta indica* (neem), *Aloe vera*, *Sapindus mukorossi* (reetha), *Hibiscus rosa-sinensis*, and *Trigonella foenum-graecum* (fenugreek), each selected herbal plant for their established antimicrobial, anti-inflammatory, and hair-nourishing effects. The formulation process involved the extraction of bioactive compounds using aqueous or hydroalcoholic methods, followed by blending in optimized proportions to ensure stability, lathering ability, viscosity, and pH balance suitable for scalp application. The prepared shampoo was evaluated through a series of physicochemical tests, including foam stability, dirt dispersion, wetting time, and surface tension measurements, in addition to microbiological analysis to confirm its preservative efficacy.

KEY WORDS: Cosmetics, Dandruff, Herbal Shampoo, *Azadirachta Indica* (Neem), *Aloe Vera*, *Sapindus Mukorossi* (Reetha), *Hibiscus Rosa-Sinensis*

INTRODUCTION:

Human hair

Parts of the Hair

Dermal papillae: The dermal papilla is responsible regulating the hair cycle and hair growth, and is also comprised of androgen receptors that are Sensitive to the presence of DHT

Bulb Outer root sheath: The outer root sheath, or, is the outermost part of the hair and is Keratinized. Inner root sheath: internal root sheath is comprised of three parts: the Henley layer, Huxley layer, and Cuticle.



Shampoo:

Shampoo is a cosmetic product that's a preparation of surfactants that cleans the hair and scalp without harming the user. Shampooing is the most common form of hair treatment. Shampoos have primarily been products aimed at cleansing the hair and scalp. Selected ingredients of shampoo that have been popular with the consumer are currently under attack because of potential risks associated with their use (e.g. Halogenated organic compound, formaldehyde, musk [1].

Shampoo in simple terms is a hair care product designed to clean the scalp skin along with its hairs. Incidentally, the term shampoo entered the English language through India where the Hindi word "champoo" was used meaning to press or massage; it was used to denote cleaning through massage of the hair and skin. [2] Cleaning the hair has always been a tough task especially for women. An average western woman has 4-8 square meters of hair. [3] This will probably be more for the average Indian women due to culture of keeping long hair. Traditional soaps which were used earlier for both skin and scalp are not recommended anymore for hair cleaning as they don't have good lathering capability and leave behind "soap scum" when mixed with hard water which is difficult to rinse off. Modern shampoo as it is known today was first introduced in the 1930s with Drene, the first shampoo using synthetic surfactants instead of soap. Used initially for laundry and for cleaning carpets and cars, they later evolved as hair shampoo. [4]

Types of shampoos:

- Liquid shampoo
- Strong cream shampoo
- Gel shampoo
- Powder shampoo
- Lubrication shampoo
- Aerosol foam shampoo

Ideal characters of shampoo:

- It should effectively and completely remove dust, excess sebum.
- More foam should be produced.
- The shampoo should be easily removed by washing with water.
- They should leave the hair dry, soft, shiny and manageable.
- It gives pleasant smell to hair.
- It should not make the hand rough and cracked.

- It should not cause side effects or cause irritation to the skin or eyes.

Composition of shampoo:

- The main surfactant
- Second surfactant
- Antidandruff
- Conditioning agents
- Pearlescent agents
- Carriers
- Fluid agents.
- Colors, perfumes and preservatives.

What shampoos contain?

Basic formulation of ingredients and their functions for all standard shampoos is listed in Figure 1.[5] It is important to realize that the only ingredients that are important for the cleansing and the manageability of the hairs are the synthetic detergents and the conditioners while the rest aid in the stability, present ability and marketability of the product. A brief discussion of the ingredients is as follows.

Advantages of shampoo:

- Improving hair hygiene.
- Treating scalp conditions
- Treatment for dry scalp
- Treatment for hair loss.
- Treatment for greasing or oily hair.
- Relieves itch and irritation.
- Repairs damaged hair.
- Shampoo keeps hair silky or smooth.
- Keeps your hair beautiful and blossomed.

Herbal Shampoo:

The herbal shampoo is a type of cosmetic preparation that uses herbs that is natural ingredients from the plant.[6] Any hair cleansing solution, made from the extracts of Ayurvedic herbs and flowers, can be termed as ‘herbal shampoo’. It can also be defined as hair care product in form of viscous liquid used to remove dirt, oil from the hair and make them clean. [7]

Advantages of herbal shampoo:

- Herbal shampoo are made out of pure and organic ingredients and there are no synthetic additives or surfactants are free of any side effects.
- Are bio-degradable and earth friendly.
- It doesn't cause irritation to the eyes.
- It is cost friendly, not much expensive.
- Regular usage of herbal shampoo can do wonders for your hair.

Benefits of herbal shampoo:

1. More Shine
2. Less Hair Loss
3. Long Lasting Colour
4. Stronger and More Fortified Hairs
5. All Natural, No Chemicals
6. Won't Irritate Skin or Scalp
7. Keep Healthy Natural Oils

Function of herbal shampoo:

1. Lubrication
2. Conditioning
3. Hair Growth
4. Maintenance of Hair Colour
5. Medication

Desired properties of herbal shampoo:

1. Ease of Application
2. Removal of More Debris
3. Easy Wet Combing
4. Fragrance
5. Low Level of irritation
6. Well Preserved
7. Good Stability

Dandruff:

- Dandruff is a scalp disorder which is characterized by excessive shedding of skin cells from the scalp. It is a common problem faced by people of all age groups. Dandruff is generally treated with shampoos containing synthetic or natural ingredients. Synthetic ingredients such as selenium sulfide or antifungals containing azole ring are often used in chemical-based shampoos; however complete eradication of dandruff is difficult with this regime [8].

Symptoms and Causes of Dandruff:

Symptoms of dandruff include:

- Scaly scalp
- Itching scalp
- Red patches
- Patches of hair loss
- Blistering or skin irritation
- A yellow crust on the scalp (in babies)

Scientists say the causes of dandruff may include:

- Fungus
- Dry skin
- Too much yeast
- Poor hygiene
- Contact dermatitis

Tea tree oil:

Essential oil from the plant *Melaleuca alternifolia*, (tea tree oil) has recently shown promising results against skin infections because of its strong antibacterial, anti-fungal, and anti-viral activities[9]. Tea tree oil contains a number of hydrocarbons and terpenes; however, terpene-4-ol is the major component. Terpene-4-ol is believed to have anti-microbial activity and could possibly be effective against *Malassezia furfur*[10]. Satchell and co-workers have demonstrated that 5% tea tree oil shampoo was effective against dandruff without any skin irritation [11]. Tea tree oil is extracted from tea tree leaves through the process of distillation. It is used for its antiseptic properties and is effective in treating cut wounds, insect bites, acne, athlete's foot, controlling mites, nail fungus, lice, and more. [12]

Uses of Tea Tree Oil:

- Eczema
- Scabies
- Bruises
- Corns
- Insect bites
- Burns
- Canker sores
- Psoriasis (a condition that leads to formation of red, silvery plaques on the skin)
- Skin infections

Wheat germ oil:

Wheat supplies staple foods for many across India. Hence, people generally value it for dietary value. However, a particular part of wheat plants has found its way into the world of cosmetics too. The germ nestling in the wheat kernel is mechanically pressed to extract wheat germ oil. This wheat germ oil benefits skin and hair in many different ways. It is rich in antioxidants and good nutrients. That is why Wheat germ oil uses are common in skincare and hair care products as a key ingredient. When used in recommended doses, wheat germ oil and products containing it can be highly enriching. Below are more details on its uses and benefits.

Names in Indian languages: Gehu rogaanu tel, Ghenu

Scientific name: *Triticum vulgare*

Chemical composition: Linoleic acid (56%), oleic acid (13%), palmitic acid (16%), and stearic acid (0.8%)

Wheat germ oil uses & benefits:

- Wheat germ oil for hair is extremely beneficial. Linoleic acid serves several purposes to keep our scalp healthy. It enables the hair to restore moisture and stimulate the growth of hair along with strengthening it.
- The oil also has antioxidants that improve the circulation of blood throughout the pores of the scalp. Further, it improves conditions like flaking scalp by giving protection from sun damage.

Neem:

- Neem, (*Azadirachta indica*), also called nim or margosa, fast-growing tree of the mahogany family (*Meliaceae*), valued as a medicinal plant, as a source of organic pesticides, and for its timber. Neem is likely native to the Indian subcontinent and to dry areas throughout South Asia [13] it has been introduced to parts of Africa, the Caribbean, and numerous counties in South and Central America. The plant has long been used in Ayurveda and folk medicine and is used in cosmetics and in organic farming applications.
- Neem trees can reach 15–30 metres (49–98 feet) in height and have attractive rounded crowns and thick furrowed bark. The compound leaves have toothed leaflets and are typically evergreen but do drop during periods of extreme drought. The small fragrant white flowers are bisexual or staminate (male) and are borne in clusters in the axils of the leaves.

Soapnut extract:

- Soap nuts, or Indian soap berries, have become increasingly popular in recent years for a variety of reasons. They are an amazing natural detergent due to a natural cleaning essence that is contained in their shell [14].
- Although they have received a lot of love and attention in the last couple of years, soapnuts have been known and used for centuries: these soap berries have historically always been an integral element of Indian customs and used widely by many Indian households.

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[15]. It is also beneficial for bleeding piles due to its Kashaya (astringent) property.

Amla :

Amla, also known as Indian Gooseberry, is an important therapeutic plant in Ayurveda, botanically known as *Phyllanthus Emblica* (*Emblica Officinalis*). The health benefits of Amla are attributed to its Rasayana (antioxidant), immunomodulatory (Rogpratirodhak), and anti-aging (Vayasthapana) properties. As per the ancient science, Amla pacifies the Pitta Dosha primarily, but it also calms the Kapha and Vata Doshas[16]. As one of the three ingredients in Triphala, Amalaki is a potent rejuvenator that nourishes the dhatus, or the body's tissues, and gently removes toxins from the body.

Hibiscus:

- Hibiscus is a genus of flowering plants in the mallow family, Malvaceae. The genus is quite large, comprising several hundred species that are native to warm temperate, subtropical and tropical regions throughout the world. Member species are renowned for their large, showy flowers and those species are commonly known simply as "hibiscus", or less widely known as rose mallow. Other names include hardy hibiscus, rose of sharon, and tropical hibiscus [17].
- The genus includes both annual and perennial herbaceous plants, as well as woody shrubs and small trees. The generic name is derived from the Greek name ἰβίσκος (*ibiskos*) which Pedanius Dioscorides gave to *Althaea officinalis*.

Aloevera:

- Aloe is a cactus-like plant that grows in hot, dry climates. It is cultivated in subtropical regions around the world, including the southern border areas of Texas, New Mexico, Arizona, and California.
- Historically, aloe has been used for skin conditions and was thought to improve baldness and promote wound healing.
- Aloe is used topically (applied to the skin) and orally. Topical use of aloe is promoted for acne, lichen planus (a very itchy rash on the skin or in the mouth), oral sub mucous fibrosis, burning mouth syndrome, burns, and radiation-induced skin toxicity. Oral use of aloe is promoted for weight loss, diabetes, hepatitis, and inflammatory bowel disease (a group of conditions caused by gut inflammation that includes Crohn's disease and ulcerative colitis).

Details of the plant materials study [18]

Sr no	Common name	Botanical name	Parts used	Category
1	Hibiscus	Hibiscus rosasinensis	Flower	Conditioning agent
2	Amla	Embilica officinalis	Fruit	Anti-dandruff agent
3	Shikakai	Acacia concinna	Powder	Detergent
4	Soapnut	Sopindus indica	Fruit	Detergent
5	Cassia	Cassia auriculata	Leaves	Antidandruff agent
6	Bring raj	Eclipta prostrata	Leaves, flower	Hair growth
7	Aloe vera	Aloe barbadensis	Leaf	Coolant

Conclusion:

A shampoo made with a blend of reetha, neem, amla, aloe vera, shikakai, hibiscus, tea tree oil, and wheat germ oil can provide a holistic approach to hair care. It can help manage dandruff, promote hair growth, and maintain the overall health of the scalp and hair. This combination of natural ingredients offers multiple benefits without the harsh chemicals found in many commercial shampoos, making it a potentially effective, safe, and eco-friendly choice for individuals struggling with hair and scalp issues.

Result:

Results indicated that the herbal formulation exhibited satisfactory cleansing efficiency, good foaming properties, and compatibility with skin pH, with no signs of irritation or adverse reactions during patch testing. Comparative analysis with commercial shampoos demonstrated the herbal product's advantages in terms of biodegradability, user acceptability, and safety profile. The study concludes that the incorporation of traditional medicinal plants into modern hair care products can offer a holistic approach to scalp hygiene, reduce dependency on chemical surfactants, and support sustainable personal care practices. Future work may focus on enhancing the shelf life and broad-spectrum antimicrobial potential of such formulations through advanced natural preservation strategies.

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