

Formulation and Evaluation of Polyherbal Antidandruff Hair Oil

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ABSTRACT

Hair plays a vital role in the personality of human and for their care we use lots of cosmetic products. Herbal formulations always have activity and comparatively lesser or no side effects with synthetic. This study aimed at reviewing the importance of polyherbal hair oil for the treatment of common hair problems like dandruff. The various herbal ingredients (as extract) are used in the formulation are: Tulsi leaf, Aloe vera leaf, Neem leaf, Hibiscus flower, Almond oil, and Coconut oil. All ingredients provide essential nutrients such as vitamin, antioxidant, protein, terpenoids, and many essential oils to maintain normal function of sebaceous glands. The formulated oil was evaluated for its organoleptic properties, acid value, saponification value, viscosity, pH etc. All the parameters were found to be good and within the standards.

Keywords: Polyherbal, Oil, Hair, Dandruff, Formulation, Evaluation

1.1. Hair

I. INTRODUCTION

Hairs are the integral part of human beauty. It is a protein filament that grows from follicles on the dermis or skin. Scientifically it is known as pili or pilus. It is a component of the integumentary system and extends downward into the dermal layer where it sits in the hair follicle. The presence of hair is a primary differentiator of mammals as a unique class of organisms. In humans, it is a cherished and highly visible indicator of health, youth, and even class. It has a sensory function, protects from cold and UV radiation, and can have a significant psychological impact when its growth or structure is deranged. At a microscopic level, the variety in length, color, diameter, and cross-sectional shape of each hair creates the characteristic profiles seen across ethnic groups and among individuals [1].

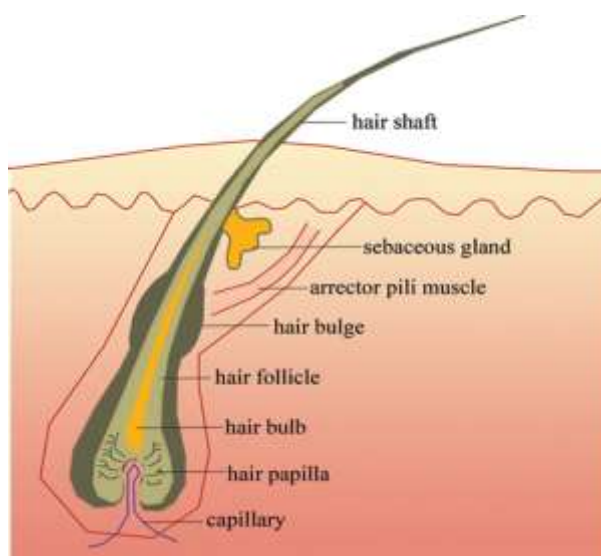


Figure 1.1. Anatomy of a human hair.

1.1.1. Hair Anatomy

Hair grows from hair follicles situated within the fatty layer of the scalp. Contrary to the popular belief that hair grows as single strands, hair follicles actually grow in groups of 1-4 hairs called “follicular units”. At the base of each hair follicle is a hair bulb where the growth mechanism for producing hair occurs. Hair follicles get their nourishment from the blood vessels within the dermis. The cells divide and develop to produce the hair shaft. While the hair is still developing underneath the epidermis, it maintains a soft form. Once the pushes past the epidermis, its outside layer hardens into keratin.

1.1.2. Parts of the Hair

1.1.2.1. Dermal papillae

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

1.1.2.2. Matrix

The matrix surrounds the dermal papillae and contains all the active cells needed for hair growth and for the development of the different parts of the hair, particularly the outer root sheath, the inner root sheath and the hair shaft. Combined, the matrix and the dermal papillae make up the hair bulb.

1.1.2.3. Outer root sheath

The outer root sheath, or tricholemma, is the outermost part of the hair and is keratinized. It covers the entire hair follicle inside the dermis and then transitions through to the epidermis, providing the hair follicle with an opening from which to surface from.

1.1.2.4. Inner root sheath

Inner root sheath is comprised of three parts: the Henley layer, Huxley layer, and cuticle. The Henley’s and Huxley’s layers are capsular layers that anchor onto each other with the purpose of stabilizing the hair. The cuticle, which is the innermost part that it closest to the hair shaft, is made from dead hardened cells and give the hair shaft added protection. This, together with the capsular layers that make up the Henley’s and Huxley’s layers, secures the hair and allows it to grow in length.

1.1.2.5. Hair shaft

The hair shaft is the solitary part of the hair follicle that fully exits the surface of the skin. The hair shaft is made up of three layers: the medulla, cortex, and the cuticle.

- The medulla is described as an unsystematic and unstructured area located in the innermost region of the hair shaft and is not always present.
- The cortex, in contrast to the medulla, is highly structured and organized. The cortex is made up of keratin and is responsible for giving hair its strength and durability, as well as its water uptake. The cortex also contains melanin and determines the color of hair based on the number, distribution and types of melanin granules present.
- The cuticle is the hair’s outer protective layer and is connected to the internal root sheath. It is a complex structure with a single molecular layer of lipids that helps hair repel water [2].

1.1.3. Hair Physiology

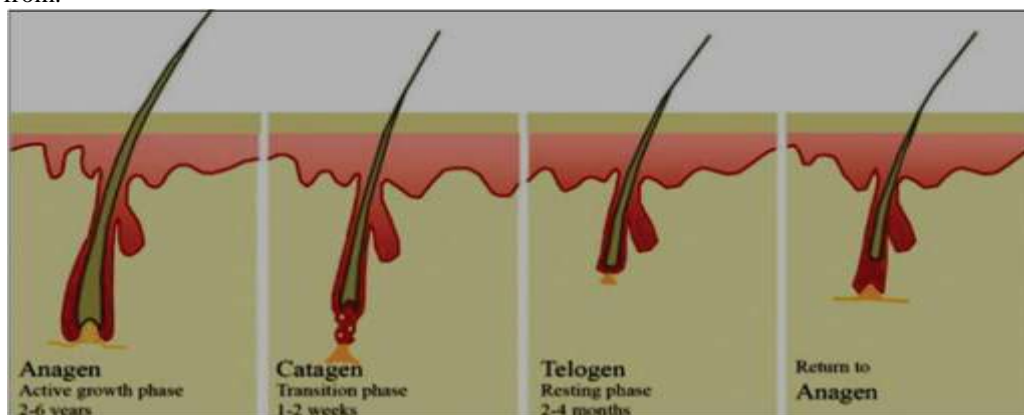


Figure 1.2. The hair cycle.

1.1.3.1. Anagen (growth phase)

Most hair is growing at any given time. Each hair spends several years in this phase.

1.1.3.2. Catagen (transitional phase)

Over a few weeks, hair growth slows and the hair follicle shrinks.

1.1.3.3. Telogen (resting phase)

Over months, hair growth stops and the old hair detaches from the hair follicle. A new hair begins the growth phase, pushing the old hair out.

1.1.4. Problems related to Hair

- Dandruff
- Dry hair
- Split ends
- Oily hair
- Frizzy hair
- Limp hair
- Hair loss
- Heat damage
- Color damage
- Grey hair [3]

1.2. Dandruff

It is a harmless, chronic condition that occurs when the scalp becomes dry or greasy and produces white flakes of dead skin that appear in the hair or on the shoulders. It is a harmless, chronic condition that occurs when the scalp becomes dry or greasy and produces white flakes

of dead skin that appear in the hair or on the shoulders. Although it is harmless, dandruff can be embarrassing for those who have it. Skin cells are formed continuously on the scalp, so the shedding of the dead skin cells is normal process. With dandruff, however skin cells are shed at a faster rate than normal. oil from the scalp causes the skin cells to clump together and appear as white flakes.

1.2.1. Causes of Dandruff

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

1.2.2. Treatment

- Follow a healthy diet
- Avoid stress
- Shampoo use a combination of special ingredients to control dandruff [4]

1.2.3. Action for Removal of Dandruff

An oil or shampoo is a preparation in a suitable form -liquids, solid or powder-which when used under the specified conditions will remove surface grease, dirt, and skin debris from the hair shaft and scalp without adversely affecting the user.

1.2.4. Action of Anti-dandruff Oil

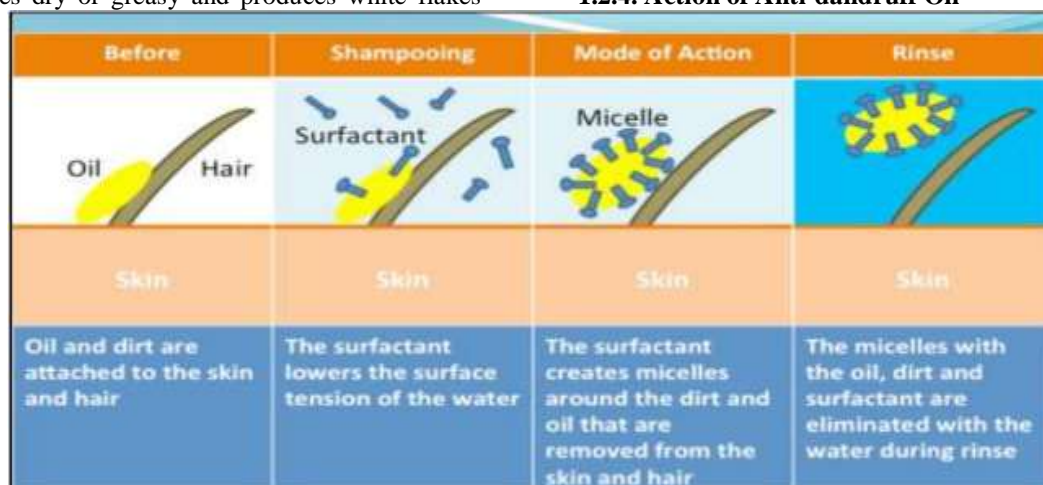


Figure 1.4. Action of ideal oil on human hair.

1.2.5. Ideal Properties of Oil

- To make the hair smooth and shiny
- Produce good amount of foam
- Should not cause irritation to scalp, skin, and eye
- Should completely, effectively remove dirt
- Impart pleasant fragrance to hair
- Good biodegradability
- Low toxicity

● Slightly acidic (pH less than 7) since a basic environment weakens the hair by breaking the disulphide bonds in hair keratin.

1.2.6. Advantages of Oil

- Cleansing properties
- 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 [5]

1.3. Herbal Oil

They are the cosmetic preparations that with the use of traditional Ayurvedic herbs are meant for

1.3.2. Common herbal ingredients employed in oil



Figure 1.5. Common herbal oil ingredients (From Left to Right: Orange peel, Reetha, Ginger, Hibiscus, Curry leaves, and Aloe).

cleansing the hair and scalp just like the regular shampoo. They are used for removal of oils, dandruff, dirt, environmental pollution, etc.

1.3.1. Advantages of Herbal Oil

- Herbal oil are made out of pure and organic ingredients and there are no synthetic additives or surfactants are free of any side effects
- They 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 oil can do wonders for your hair
- By using herbal oil, you can get the perfect oil balance
- They are made out of natural essential antiseptic properties that prevent our hair and scalp from the harsh UV-rays of the sun thus preventing skin infections [6]

II. PLANT PROFILE

2.1. Aloe vera pulp



Genus: Aloe

Species: barbadensis

Family: Liliaceae

Biological Source: Aloe is the dried juice collected by incision, from the bases of the leaves of various species of Aloe.

Geographical Source: Aloes are indigenous to East and South Africa, but have been introduced into the West Indies and into tropical countries, and will even flourish in the countries bordering on the Mediterranean.

Chemical constituents: Aloe contains a mixture of crystalline glycosides known as aloin 4-5% in cape Aloe 18-25% in Curacao Aloe, resin (16-37%), emodin, and volatile oil. It also possess the anthraquinone glycoside like barbaloin (aloe-emodin anthrone C-10 glucoside), chrysophanic acid, B-barbaloin and iso-barbaloin.

Uses: The drug Aloes is one of the safest and stimulating purgatives, in higher doses may act as

abortifacient. Its action is exerted mainly on the large intestine; also it is useful as a vermifuge. The plant is emmenagogue, emollient, stimulant, stomachic, tonic and vulnerary. Extracts of the plant have antibacterial activity. The clear gel of the leaf makes an excellent treatment for wounds, burns and other skin disorders, placing a protective coat over the affected area, speeding up the rate of healing and reducing the risk of infection. To obtain this gel, the leaves can be cut in half along their length and the inner pulp rubbed over the affected area of skin. This has an immediate soothing effect on all sorts of burns and other skin problems.

Marketed Products: It is one of the ingredients of the preparations known as Diabecon, Evecare (Himalaya Drug Company), Mensonorm (Chirayu Pharma) and Kumari Asava (Baidyanath).

2.2. Tulsi leaves



Genus: Ocimum

Species: sanctum

Family: Labiatae

Biological Source: Tulsi consists of fresh and dried leaves of *Ocimum sanctum* Linn.

Geographical Source: It is a herbaceous, much branched annual plant found throughout India, it is considered as sacred by Hindus. The plant is commonly cultivated in garden and also grown near temples. It is propagated by seeds. Tulsi, nowadays, is cultivated commercially for its volatile oil.

Chemical constituents: Tulsi leaves contain bright, yellow coloured and pleasant volatile oil (0.1 to 0.9%). The oil content of the drug varies depending upon the type, the place of cultivation and season of its collection. The oil is collected by steam distillation method from the leaves and flowering tops. It contains approximately 70% eugenol, carvacrol (3%), and eugenol-methyl-ether

(20%). It also contains caryophyllin. Seeds contain fixed oil with good drying properties. The plant is also reported to contain alkaloids, glycosides, saponin, tannins, an appreciable amount of vitamin C and traces of maleic, citric, and tartaric acid.

Uses: The fresh leaves, its juice and volatile oil are used for various purposes. The oil is antibacterial and insecticidal. The leaves are used as stimulant, aromatic, spasmolytic, and diaphoretic. The juice is used as an antiperiodic and as a constituent of several preparations for skin diseases and also to cure earache. Infusion of the leaves is used as a stomachic. The drug is a good immunomodulatory agent.

Marketed Products: It is one of the ingredients of the preparations known as Abana, Diabecon, Diakof, Koflet (Himalaya Drug Company), Respinova (Lupin Herbal Laboratory), Amulcure (Aimil Pharmaceuticals), Nomarks (Nyle Herbals), Sualin (Hamdard), and Kofol syrup (Charak Pharma Pvt. Ltd.).

2.3. Hibiscus flower



Genus: Hibiscus

Species: sabdariffa

Family: Malvaceae

Biological Source: Hibiscus consists of fresh and dried leaves and flowers of Hibiscus sabdariffa.

Geographical Source: H. sabdariffa is native to Central and West Africa, but grows throughout many tropical areas. This annual herb grows to 1.5 m or higher and produces elegant red flowers. The flowers (calyx and bract portions) are collected when slightly immature. The major producing countries are Jamaica and Mexico.

Chemical constituents: A large variety of compounds have been isolated from the hibiscus plant. As expected from their vivid color, hibiscus flowers contain various polyphenols, including

anthocyanins, proanthocyanidins, flavonols, and other pigments. Oxalic, malic, citric, stearic, and tartaric acids have been identified and are, along with 15% to 28% of hibiscic or hibiscus acid (lactone of hydroxycitric acid), most likely contribute to the tartness of the herb and its teas.

Uses: The traditional medicinal uses of the plant are varied and include the use of hibiscus flowers for the treatment of cardiovascular diseases, high blood pressure, high level of fats in the blood, diabetes, obesity, and the unsweetened tea made from the flowers is used in Mexico to treat coughs.

Marketed Products: It is one of the ingredients of the preparations known as AllPure (Himalayan Herbaria Inc. Ltd.)

2.4. Neem leaves



Genus: Azadirachta

Species: indica

Family: Meliaceae

Biological Source: Neem consists of fresh and dried leaves of Azadirachta indica.

Geographical Source: It grows in tropical and semi tropical regions and is widely found in Burma, India and Pakistan. This is a very fast growing, evergreen tree which reaches the height of 15 to 20 meters.

Chemical constituents: Neem tree has numerous medicinal properties by virtue of its chemical compounds. Seeds of the Neem tree contain the highest concentration of azadirachtin. Apart from azadirachtin, salannin, gedunin, azadirone, nimbin,

nimbidine, nimbicidine, nimbinol, etc. are other important liminoids of neem.

Uses: The Neem tree has many medicinal uses. The chemical compounds present in neem have anti-inflammatory, antiarthritic, antipyretic, hypoglycaemic, antifungal, spermicidal, antimalarial, antibacterial, and diuretic properties. Flower, leaves, bark and seeds of neem are used in home remedies and in preparation of medicines. Bark of neem acts as antipyretic and helps to reduce fever. Flowers are used in intestinal disorders. Juice from fresh leaves is very helpful in treating skin diseases, wounds, and obesity. Oil from neem seeds is used in arthritis, skin diseases

and muscular sprains. Neem is very effective in treating gum diseases.

Marketed Products: It is one of the ingredients of the preparations known as Organic Neem Oil

(Kama Ayurveda Ltd.) and Purifying Neem Peel-Off Mask (Himalaya Herbals Ltd.).

2.5. Almond oil



Genus: Prunus

Species: amygdalus

Family: Rosaceae

Biological Source: Almond oil is a fixed oil obtained by expression from the seeds of *Prunus amygdalus* (Rosaceae) var. *dulcis* (sweet almonds) or *P. amygdalus* var. *amara* (bitter almonds).

Geographical Source: The oil is mainly produced from almonds grown in the countries bordering the Mediterranean (Italy, France, Syria, Spain, and North Africa) and Iran.

Chemical constituents: Both varieties of almond contain 40–55% of fixed oil, about 20% of proteins, mucilage and emulsin. The bitter almonds contain in addition 2.5–4.0% of the colourless, crystalline, cyanogenetic glycoside amygdalin. Almond oil is obtained by grinding the seeds and expressing, them in canvas bags between slightly heated iron plates. The oil is clarified by subsidence and filtration. It is a pale yellow liquid

with a slight odour and bland nutty taste. It contains olein, with smaller quantities of the glycosides of linoleic and other acids. Bitter almonds, after maceration on hydrolysis of amygdalin yield a volatile oil that is used as a flavouring agent. Sweet almonds are extensively used as a food, but bitter almonds are not suitable for this purpose.

Uses: Expressed almond oil is an emollient and an ingredient in cosmetics. Almond oil is used as a laxative, emollient, in the preparation of toilet articles and as a vehicle for oily injections. The volatile almond oils are used as flavouring agents.

Marketed Products: It is one of the ingredients of the preparations known as Baidyanath lal tail (Baidyanath Company), Himcolin gel, Mentat, Tentex Royal (Himalaya Drug Company), and Sage badam roghan (Sage Herbals).

2.6. Coconut oil



Genus: Cocos

Species: nucifera

Family: Palmae

Biological Source: Coconut oil is the oil expressed from the dried solid part of endosperm of coconut.

Geographical Source: Coconut is widely distributed throughout the world. It is largely cultivated in African and southeast Asian countries. Coconut also known as copra is a dietary as well as industrial product throughout the world. Large

quantity of oil is produced in India, Sri Lanka Malaysia, South Africa, China, Indonesia 2%; capric acid, 50–80%; lauric acid, 3%; and myristic acid about 1%.

Uses: Coconut oil is used as dietary products in many areas of the world. In European pharmacopoeia, fractionated coconut oil is known as ‘Thin vegetable oil’. It is useful as a nonaqueous medium for the oral administration of some medicaments. Fractionated coconut oil is used as a basis for the preparation of oral suspension of drugs unstable in aqueous media. Diets based on medium chain triglycerides including preparations made from coconut oil are used in conditions associated with malabsorption of fat such as cystic fibrosis, enteritis, and steatorrhea. Abdominal pain and diarrhoea have been reported in patients taking diet based on medium chain triglycerides.

Marketed Products: It is one of the ingredients of the preparations known as Lip balm and Evecare (Himalaya Drug Company).

III. RESULTS

3.1. Physical appearance/visual inspection

These liquid formulations (F1-F5) have greenish brown color with a pleasant odor. The formulations have a little greasy nature. No taste related information was recorded.

3.2. pH

The pH of all formulations lies in the range of 5.53-5.98 and was found to be in close proximity with the pH of scalp, thereby reducing the irritation (Table 2).

Table 2. pH characteristics of polyherbal oil formulations.

FORMULATION	pH
F1	5.73±0.02
F2	5.82±0.04
F3	5.53±0.03
F4	5.98±0.02
F5	5.67±0.03

3.3. Viscosity

Viscosity have an important role in explaining and controlling many attributes like shelf life stability and product aesthetics such as clarity, ease of flow on removal from packing and spreading when

apply to hair. The viscosity was found to be highest in formulation-2 (6.182×10^{-3} cps) followed by third formulation (7.008×10^{-3} cps) whereas F1 has the least viscosity characteristics (6.182×10^{-3} cps) (Table 3).

Table 3. Viscosities of polyherbal oil formulations.

FORMULATION	RHEOLOGY (cps)
F1	$6.182 \times 10^{-3} \pm 0.389$
F2	$7.049 \times 10^{-3} \pm 0.662$
F3	$7.008 \times 10^{-3} \pm 0.471$
F4	$6.964 \times 10^{-3} \pm 0.657$
F5	$6.491 \times 10^{-3} \pm 0.539$

3.4. Sensitivity test

All formulations (F1-F5) were found to be very compatible with the human skin or scalp. No skin irritations or whirl/flare/papule were noticed in individuals. This concluded that all the formulations have desired safety to be applied to scalp (topical application).

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