

Design and analysis of herbal hair oil

Ramakrishna s *, Madhushree K and Ruqiya bi

Varadaraja Institute of Pharmaceutical Education and Research, Tumkur, Karnataka, India.

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Abstract

The significance of herbal hair oil for the longevity of hair health is highlighted in this study. Hair care products applied to the hair to cure hair issues include herbal hair oil. A vital component of natural cosmetics is herbal hair oil. The goals of herbal hair oil are discussed in this article, along with how it may improve hair health, control frizz, prevent hair loss, and more. This focuses on the components that are frequently used to make herbal hair oil, such as coconut oil, sesame oil, mustard oil, and other herbal ingredients. Herbal hair oil is more in demand and utilized for several hair conditions.

Keywords: *Cassia auriculata*; Mustard oil; Sesame oil; Herbal Hair oil

1. Introduction

Human personality is greatly influenced by one's hair. Mammals are known for having hair, which serves a variety of purposes for the body, including protecting it from the elements heat, cold, etc.[1] Hair's bulb, root, and shaft are its constituent parts.[2] The purpose of the study is to evaluate the significance of herbal oils and how they may be used to treat a variety of conditions, including dandruff, split ends, balding, hair loss, and dryness. [3] Despite its seemingly basic appearance, a hair strand is one of the body's most intricate structures.

Hair is made up of two structures:

1.1. Hair follicle

Hair starts to develop and is retained in place in the hair follicle. It is a structure that begins in the epidermis and resembles a stocking. It reaches the dermis. An inner and outer sheath that lines the follicle ends immediately before the sebaceous gland opening, protecting and shaping the hair as it grows.

1.2. Hair shaft

The hair shaft is the part of the hair that is made up of three layers of keratin.

Those are:-

- The inner layer:- Also called as medulla. Depending on type of hair.
- The middle layer:- This is called the cortex
- The outer layer:- Also called as cuticle, which is formed by tightly packed scales

* Corresponding author: Ramakrishna s

1.3. Hair growth cycle

Hair growth cycle consists of 3 stages:-[4]

- Anagen phase: This is the stage during which hair grows. Between two and six years will pass during the anagen period. The newly formed hair forces the newly formed hair that stopped growing out of the follicle.
- The catagen phase: Three percent of all hairs are in this transitional state at any one moment. For two to three weeks, this period lasts.
- Telogen phase: The telogen phase, which lasts for two to three months, is the resting phase. The club hair is fully developed and the hair follicle is at rest during the telogen phase.

1.4. Hair types

The pattern of curls in hair is the main indicator of hair type. Hair follicles determine the degree of curl in hair. Genetics determines the kind of hair.

- Type 1:- Straight
- Type 2:- Wavy
- Type 3:- Curly
- Type 4:- Coily

1.5. Hair Oil

Among the items for hair care is hair oil. Formulations that may be used for a variety of purposes, such as cleansing, modifying the texture of hair, feeding the hair, and maintaining the look of healthy hair, are identified as hair care. Hair oil is a component of hair care products that aids in the treatment of hair disorders such as baldness, graying hair, hair loss, dry hair, dullness, and split ends. It also nourishes hair.[6] Hair oil contains special properties that not only improve the appearance of hair but also stimulate hair growth. They're also used to tame frizzy hair.

In order to keep hair healthy and stop hair loss, the Charaka Samhitha, an Ayurvedic medical text, recommends oiling the hair and scalp. Additionally, oiling and moisturizing the scalp can strengthen and promote the development of new hair.

2. Drug profile

2.1. *Cassia auriculata*

- **Botanical name:-** *Senna auriculata*
- **Family:-** Fabaceae
- **Biological source:-** Senna consists of the dried leaflets or fruits of *Cassia senna* (*C. acutifolia*) known in commerce as Alexandrian senna and of *Cassia angustifolia* commonly known as Tinnevely senna.
- **Description:-** The evergreen shrub *Cassia auriculata* is found across Asia and several regions of India. Ayurvedic medicine, in particular, makes use of the flower, buds, leaves, stem, root, and unripe fruit for therapeutic purposes.
- **Active constituents :-** Flavones, flavonols, flavonoids glycosides, alatinon, alanonal, and β -sitosterol- β -D-glucoside are among the metabolite chemicals that have been identified from *C. auriculata*. Mostly the leaves are where the chemicals have been extracted.
- **Uses :-**
 - It fortifies, thickens, and adds luster to hair.
 - Its antifungal qualities help soothe dandruff and an itchy scalp on the scalp.



Figure 1 Leaves of *Cassia auriculata*

2.2. Brahmi

- **Botanical name:-** *Bacopa monnieri*.
- **Family:-** Plantaginaceae.
- **Botanical source:-** The stem and fresh or dried leaves of *Bacopa monnieri* are used to make brahmi. It is a weak, creeping herbaceous plant that grows near backwaters and marshes.
- **Description:-** Brahmi is a soft, creeping, perennial plant with succulent leaves that is non-aromatic. It has many branches that flourish in damp, swampy areas. This plant is edible and can reach a height of 6 inches. Its branches spread out horizontally to cover the ground.
- **Active constituents:-** *Bacopa monnieri's* chemical contents also include the alkaloids brahmine, herpestine, and nicotine, in addition to hersaponin, apigenin, D-mannitol, monnierasides 1-3, plantainoside B, and cucurbitacin.
- **Uses :-**
 - The herb brahmi aids in the formation of a shield around the hair fibers.
 - It contributes to keeping the hair shiny and silky.
 - Brahmi aids in keeping the scalp clean and clear of any problems associated with it, such as dandruff, acne, etc.



Figure 2 Leaves of *Bacopa monnieri*

2.3. Hibiscus

- **Botanical name:-** *Hibiscus rosasinensis*.
- **Family:** - Malvaceae.
- **Biological source:-** Hibiscus is a fresh flower of *Hibiscusrosasinensis*.

- **Description:-** Bisexual flowers of around 6 to 12 cm in diameter, with a thin, jointed pedicel that is pubescent with hairs below. The epicalyx is about 1 to 1.5 cm in length, and the base is 5-8. The flowers are valvate, occasionally with nectarines, and persistent, with erect glandular hairs outside.
- **Active constituents:-** There are several other chemical ingredients, such as quercetin, gossypetin, polysaccharides, arabin and arabinogalactans, anthocyanin, beta-carotene, beta-sitosterol, citric acid, alkaloids, and trace quantities of gallicitone, arabinose, glucose, xylose, mannose, and rhamnose.
- **Uses:-**
 - Put an end to hair loss.
 - Gives hair a vibrant, healthy appearance.
 - Avoid becoming gray too soon.
 - Increase volume and thicken hair.
 - Manage dandruff.
 - Protect from breakage, frizz, and dryness.
 - Avoid split ends.



Figure 3 Leaves and flowers of *Hibiscus rosasinensis*

2.4. Fenugreek leaves

- **Botanical name:-** *Trigonella foenum graecum*
- **Family:** Fabaceae
- **Botanical source:-** Fenugreek Biological is a dried seeds of *Trigonella foenum graecum*.
- **Description:-** The fenugreek has a pungent, spicy smell and a greenish-olive or brownish color. The seeds are square or oblong, 6 to 8 mm long.
- **Active constituents:-** Trimethylamine, Neurin, Trigonelline, Choline, and Carpaine are examples of alkaloids. Isoleucine, histidine, leucine, and lysine are the amino acids. Saponins: Trigofenosides A-G, Fenugrin B, Fenugreekine, and Graecunins.
- **Steroidal:** Yamogenin, Diosgenin, Smilagenin.
- **Uses:-**
 - Stops hair thinning.
 - The natural emollient lecithin, which is found in fenugreek, thoroughly hydrates and conditions your hair and scalp.
 - Repairs damaged hair.
 - Combats Dandruff.
 - Reduces irritation of the scalp.
 - Enhances delicate texture and gloss.



Figure 4 Leaves of *Trigonella foenum graecum*

2.5. Amla

- **Botanical name** :- *Phyllanthus emblica*
- **Family** :- Phyllanthaceae
- **Botanical source**: Amla is a fresh fruit of *phyllanthus emblica*
- **Description** : When amla reaches maturity, its color changes from green to light yellow to brick red. Its flavor is astringent, acidic, and lacks structure. Features: Diameter: 1.5 to 2.5 cm. Fruits and fresh, smooth, four-lobed seeds with six trygonus are hard to look at.
- **Active Constituents**: Ascorbic acid, vitamin C, polyphenols (ellagic acid, chebulagic acid, gallic acid, apeigenin, quercetin, corilagin, leutolin), and a number of bioactive phytochemicals.
- **Uses**:
 - Boosts the immunological system.
 - Has antioxidant properties.
 - May promote the development of hair.
 - Fortify the and hair
 - Minimize hair loss.
 - Prevent or cure infections of the hair and scalp caused by parasites, such as lice.



Figure 5 Leaves and Fruits of *Phyllanthus emblica*

2.6. Vetiver plant root[*lavancha* roots]

- **Botanical name**:- *Chrysopogonzizanioides*
- **Family**:- Poaceae
- **Biological source**:- Lavancha is a dried roots of *Chrysopogonzizanioides*.

- **Description:-** The long, thin, and rather stiff leaves are paired with tall stalks. The blooms have a purple tint. The roots of vetiver grow downward, reaching depths of 2 meters (7 feet) to 4 meters (13 feet), in contrast to other grasses, whose root systems extend horizontally and resemble mats. Growing in tufts, the vetiver bunch grass is sociable.
- **Active constituents:-** Veterinarian essential oil mostly contains carvone, isovalencenol, and khusimol as its chemical components. Husimol and isovalencenol are two sesquiterpenes that belong to the functional category of alcohols. Vetiver essential oil is a grounding oil, and these chemicals also have grounding qualities.
- **Uses**
 - This oil's antimicrobial qualities help to increase blood flow to the hair follicles.
 - Stops a range of hair illnesses.
 - Participates in the synthesis of collagen.
 - A one-stop shop for any hair-related issues



Figure 6 Leaves of *Chrysopogon zizanioides*

2.7. Bhringaraj

- **Botanical name:-** *Eclipta alba* linn
- **Family:-** Asteraceae
- **Biological source:-** Dried *Eclipta alba* leaves are used to make bhringaraj. It is a member of the family of sunflowers.
- **Description:-** Bhringaraj is a 3 meter-tall creeping plant. This plant is annual, upright, branching, and frequently roots at nodes. This plant features white blooms on a short, flat, rounded stem with a long stalk. The leaves are lance-shaped, sessile, and opposite. This plant has well-developed, cylindrical, grayish roots.
- **Active constituents:-** The plant has been found to contain the alkaloid ecliptine. Other compounds that have been discovered include apigenin, luteolin, wedelolactone, and b-amyrin.
- **Uses:-**
 - Handles dry scalp and dandruff.
 - Promotes hair growth and treats balding.
 - Stops hair loss.
 - Encourages the development of hair.
 - Stops hair from going gray.
 - Adds shine to hair.
 - Mends damage to hair.



Figure 7 Leaves of *Eclipta alba* linn

2.8. Orange peel powder

- **Botanical name:-** *Citrus sinensis*
- **Family:-** Rutaceae.
- **Biological source :-** The outer layer of the pericarp of *Citrus aurantium* Linn., either fresh or dried, is called the orange peel.
- **Description:-** The aroma of oranges and other citrus fruits is sweet and zesty, and it is also present in orange peels. Bitterness: Because flavonoids and other chemicals are present, orange peels taste bitter. Texture: The surface of orange peels is textured and dotted with tiny, raised bumps.
- **Active constituents :-** Triterpenoids (limonoids and carotenoids), phenolic compounds (flavonoids, phenolic acids, and coumarins), and pectin. Orange peels include 11% hemicellulose, 22% cellulose, 25% pectins, and 23% sugar. These values allow for the possibility of biochemical transformations, such as the generation of bioethanol or biogas.
- **Uses:-**
 - **Antibacterial Properties:** Orange peel's inherent antibacterial qualities can help to maintain a healthy, disease-free scalp.
 - **Antioxidants:** Vitamin C and other antioxidants are abundant in orange peel. These antioxidants shield your scalp from the aggravating effects of free radical damage, which can worsen dandruff. Aid in preventing hair loss and promoting hair growth.



Figure 8 Powder of orange peel {*Citrus sinensis*}

2.9. Curry leaves

- **Botanical name: -** *Murraya koenigii*.
- **Family:-** Rutaceae.
- **Botanical source:** Family Rutaceae, genus *Murraya*, includes the curry leaf tree. It is called "curry leaves" because the leaves are usually used in curries. The Indian subcontinent is home to the tree, which is mostly grown for food.

- **Description:** Curry leaves are bipinnately complex, with spiral-arranged leaves that are 15-20 cm in length and leaflets that measure 3–4 cm in length and 1-2 cm in breadth. Depending on the species and variety, differences were also noted.
- **Active constituents:** By employing GC and GC-MS, it was discovered that the majority of the oils from the curry leaves included oxygenated monoterpenes. A total of 33 components were identified, with the primary chemicals being linalool (32.83%), elemol (7.44%), geranylacetate (6.18%), myrcene (6.12%), allo-ocinene (5.02%), α -terpinene (4.9%), and (E) B-ocimene (3.68%)..
- **Uses :-**
 - Their beta-carotene and protein content helps to prevent hair thinning.
 - The antioxidants in curry leaves have the ability to eliminate dead scalp follicles.
 - Giving the scalp and hair a massage.
 - Curry leaves are a good source of protein, which is also necessary for healthy hair.



Figure 9 Leaf of *Murraya koenigii*.

2.10. Neem leaves

- **Botanical name :-** *Azadirachta indica*
- **Family :-** Malvaceae
- **Biological source :-** Neem consists of the fresh or dried leaves and seed oil of *Azadirachta indica* J. Juss (*Melia Indica* or *M. azadirachta* Linn.).
- **Description :-** Beautiful broad-leaved evergreens, neem trees may reach heights of 30 m and widths of 2.5 m. Their outspreading branches create circular crowns up to 20 meters in diameter. A severe drought may cause the leaves to fall off, but otherwise they stay in leaf. The compound, imparipinnate leaves have five to fifteen leaflets on each leaf. When the green drupes mature in the months of June through August, they turn a golden yellow color.
- **Active constituents :-** Of the active ingredients, azadirachtin is the most significant; the others include quercetin, gedunin, sodium nimbin, nimbin, nimbidin, and nimbidol. Nimbins, glycoproteins, triterpenes, limonoids, flavonoids, phenols, tannins, azadirachtin, saponins, catechins, and gallic acid are the main phytochemicals found in neem.
- **Uses :-**
 - scalp is left feeling hydrated and in good condition as they lessen flakiness, dryness, and itching.
 - Their antifungal and antibacterial characteristics effectively eradicate dandruff and alleviate irritation on irritated and dry scalps.



Figure 10 Leaf of *Azadirachta indica*

2.11. Mustard oil

- **Botanical Name:-** *Brassica Juncea*
- **Family :-** Cruciferae
- **Biological source :-** It is a fixed oil obtained from matured seeds of *Brassica nigra* Koch or *Brassica juncea* L. Czern.
- **Description :** Amber or reddish-brown in color, mustard oil is distinguished by its powerful flavor and strong aroma.
- **Active constituents :** Mustard's distinct spicy and aromatic flavor is mostly generated from isothiocyanates made from the parent chemicals sinigrin and sinalbin, however other glucosinolate-derived products, including goitrin, may also exist in much lesser amounts. approximately 60% of mustard oil is made up of monounsaturated fatty acids (MUFA), which include 42% erucic acid and 12% oleic acid. It also contains approximately 21% polyunsaturated fats (PUFA), which are made up of 15% omega-6 linoleic acid (LA) and 6% omega-3 alpha-linolenic acid (ALA). Finally, about 12% of mustard oil is made up of saturated fats.
- **Uses :-**
 - Mustard Oil Promotes Hair Development.
 - Mustard Oil Tightens Hair.
 - Better Blood Circulation with Mustard Oil.
 - Healthy Scalp with Mustard Oil.
 - Dry hair is avoided by using mustard oil.
 - Improves Appearance Throughout.
 - Prevents hair loss and is a component of pre-shampoo care.



Figure 11 Oil from seeds of *Brassica Juncea*

2.12. Sesame oil

- **Botanical name** :- *Sesamum indicum* L.
- **Family** :- Pedaliaceae
- **Biological Source**:- Sesame oil is obtained by refining the expressed or extracted oil from the seeds of cultivated varieties of *Sesamum indicum* Linn.
- **Description** :- Fried sesame oil is a pale yellow liquid with a nice grainy smell and somewhat nutty taste, derived from unsalted sesame seeds. Amber-colored and fragrant, oil derived from crushed and roasted sesame seeds is used as a seasoning during the last stages of cooking.
- **Active constituents** : Apart from its abundant nutritional value, sesame also has several essential functional elements including sesamin, sesamol, sesamol, sesaminol, sesamol phenol, and other active compounds that resemble lignans. About 50–60% of sesame seeds are made up of premium oil that is enriched in polyunsaturated fatty acids (PUFA), natural antioxidants, sesamin, sesamol, and tocopherol homologues.
- **Uses** :-
 - Blood circulation on the scalp is increased by sesame oil, which encourages hair growth.
 - Furthermore, it has high levels of omega-3 and omega-6. Studies indicate that a lack of these fatty acids contributes to hair loss.



Figure 12 Oil from seeds of *Sesamum indicum*

2.13. Coconut oil

- **Botanical name**:- *Cocos nucifera*
- **Family**: Arecaceae
- **Biological source**: It is compressed oil from the fruit of *Cocos nucifera*
- **Description**:- The coconut oil has greasy in nature and it smells fragrant. The taste is mild sweeter
- **Active constituents**:- Fatty acids found in coconut oil include caprylic acid (C-8:0), lauric acid (C-12:0) (49%), myristic acid (C-14:0) (8%), palmitic acid (C-16:0) (8%), stearic acid (C-18:0) (2%), oleic acid (C-18:1(6%)), and 2% of C-18:2 linoleic acid.
- **Uses**
 - Aids in sealing and moisturizing hair.
 - Coconut oil guards against dandruff and a dry, flaky scalp.
 - Prevents hair breakage and split ends.
 - Applying coconut oil to hair both before and after washing aids in reducing damage.



Figure 13 Oil from *Cocus nucifera*

3. Materials and Methods; [7]

Table 1 Herbal ingredient profile

Sl.no	ingredients	Quantity	parts used
1	Cassia Auriculata	25 gm	Leaves
2	Brahmi	25 gm	Leaves
3	Hibiscus	25 gm	Leaves / Flowers
4	Fenugreek	25 gm	Leaves
5	Amla	25 gm	Leaves
6	Lavanha	15 gm	Grass
7	Bhringraj	20 gm	Leaves
8	Orange Peel	25 gm	Powder
9	Curry Leaves	03 gm	Leaves
10	Neem Leaves	05 gm	Leaves
11	Mustard Oil	25 ml	Seeds
12	Sesame Oil	25 ml	Seeds
13	Coconut Oil	750 ml	Fruit

3.1. Procedure

3.1.1. Preparation of herbal paste

The recommended composition was followed to make a paste, which was then ground using a mixer grinder, employing all of the above-mentioned herbal components except the oils.

3.1.2. Preparation of Herbal Hair Oil

Next, warm up the ground blend. Add 750 milliliters of coconut oil to the mixture above. After heating the material above for about 45 minutes on low heat, 25 milliliters of mustard and sesame oil were added gradually, and the heating process was continued for an additional 10 minutes. Following the oil's separation, cooling was allowed. After that, muslin cloth was used to filter it. Finally, a dry, clean bottle was used to keep it.

3.2. Qualitative phytochemical investigation of herbal hair oil

We next ran qualitative testing on the herbal hair oil to identify various plant ingredients.

3.2.1. Detection for Carbohydrates

Fehling's test: Fill a clean test tube with a little amount of oil. Heat it and add two milliliters of hydrochloric acid. Add one milliliter of sodium hydroxide to the mixture above. Pour in the same amount of Fehling's A and B solutions. Precipitate with a crimson color shows the presence of reducing sugar.

3.2.2. Detection of Alkaloids

- **Mayer's test :** Transfer a little amount of oil into a sterile test tube and add Mayer's reagent. The production of cream foam signifies the existence of alkaloids.
- **Dragendorff's test:** Fill a clean test tube with a little amount of oil. Stir in the reagent of Dragendorff. The presence of alkaloids is indicated by a reddish-brown precipitate.
- **Wagner's test:** Fill a clean test tube with a little amount of oil. Stir in Wagner's reagent. The presence of alkaloids is indicated by red precipitate.
- **Hager's test:** Fill a clean test tube with a little amount of oil. Add the reagent for Hager. Precipitate with a yellow color suggests the presence of alkaloids.

3.2.3. Detection of Glycosides

- **Brontrager's test:** Fill a clean test tube with a little amount of oil. Add benzene and dil.NH₃, then thoroughly shake after adding HCL. The presence of glycosides is indicated by the appearance of white fumes.
- **Killer Kilani test:** Fill a clean test tube with a little amount of oil. Apply a solution of ferric chloride, treat it with glacial acetic acid, and then add concentrated sulphuric acid. Glycosides are present when a red color is produced.
- **Legal's test:** Fill a clean test tube with a small amount of oil. After adding water to make the mixture alkaline, add a few drops of sodium nitroprusside. The presence of glycosides is shown by the red color produced.

3.2.4. Detection of Flavonoids

Lead acetate test: Fill a clean test tube with a little amount of oil. To it, add 1 to 2 milliliters of lead acetate solution. The presence of flavonoids is indicated by the formation of a strong yellow color.

3.2.5. Detection of Tannins

Place a little amount of oil in a sterile test tube. Add a solution of ferric chloride to it. causes a brief change in color from green to black, which is indicative of tannin content.

3.2.6. Detection of Proteins

- **Millon's test:** Fill a clean test tube with a small amount of oil. Add a few drops of Millon's reagent to that. causes a precipitate or reddish brown coloration, which suggests the presence of proteins.
- **Biuret test:** Fill a clean test tube with a little amount of oil. Add an equivalent volume of copper sulfate solution and sodium hydroxide to that. Proteins are present when the sample becomes purple.

3.2.7. Detection of steroids

Hesse's test: Fill a clean test tube with a small amount of oil sample. Add an equivalent volume of concentrated sulphuric acid after adding the chloroform. Steroids are present when the sample develops a blood red color.

3.3. Evaluation of herbal hair oil formulation

3.3.1. Organoleptic Property

The prepared oil was checked for their physical properties and their results are as follows:

- Colour: Greenish yellow colour
- Physical state: Liquid with greasy in nature
- Odour: Pleasant
- Polarity: Non-polar
- Solubility: Soluble in non-polar solvents

3.3.2. Sensitivity test

The prepared herbal hair oil was applied on 1 cm skin of hand and exposed to sunlight for 4-5 min

3.3.3. pH

The pH of the oil formulation was determined by using digital pH meter.

3.3.4. Saponification value

Standardization of HCL

To prepare 0.1N KOH, weigh 27.5 ml of KOH into a round-bottom flask, add 1.5 ml of oil sample, and reflux on a boiling water bath for 50 minutes. Cool the mixture, then transfer it to a conical flask. Add two drops of phenolphthaline indicator, and titrate against 0.1N HCL measured in a burette until the yellowish-pink color changes.

Blank

Weigh about 27.5ml of KOH and add it to round bottom flask then reflux on boiling water bath for 50mins then cool and transfer it to conical flask and add 2 drops of phenolphthaline indicator and titrate against 0.1N HCL taken in burette until the colour changes from pink to colourless.

$$\text{Saponification value} = (B-T) \times N \times 56.1 / \text{Weight of oil(1g)}$$

Where,

B- blank burette reading.

S- Sample burette reading

3.3.5. Acid value

Prepare 0.1N KOH and fill it in burette, weigh 27.5ml of ethanol and 1.5ml of oil sample in a conical flask and mix well and add phenolphthalien indicator and then titrate against 0.1N KOH which was taken in burette until the colour changes from pale red to pink colour.

Blank

Weigh about 27.5ml of ethanol into conical flask and add the phenolphthalein indicator and titrate against 0.1N of KOH taken in burette until the colour changes from colourless to pink.

$$\text{Acid value} = (5.61 \times V \times N) / \text{weight of oil(1g)}$$

4. Results

4.1. Qualitative phytochemical investigation of coconut oil

The results of the preliminary phytochemical investigation of coconut oil are shown below.

Table 2 Phytochemical investigation

Sl.No	Plant constituents	Test performed	Results
1	Test for carbohydrates	Fehling's test	-
		Molisch's test	+
2	Test for alkaloids	Wagner's test	-
		Mayer's test	+
		Hager's test	+
		Drangondroff's test	+

3	Test for glycosides	Brontrager's test	+
		Killers killani test	+
		Legal's test	+
4	Test for flavonoids	Shinoda test	+
		Ferric chloride test	+
5	Test for tannins	Ferric chloride test	-
		Lead acetate test	+
		Potassium chromate test	+
-6	Test for proteins	Millon's test	-
		Xanthoprotic test	+
		Biurette test	-
7	Test for steroids	Hesse's test	+

“+” Sign shows the presence of phytochemical constituents; “-” Sign shows the absence of phytochemical constituents.

The phytochemical investigation of gingelly oil shows presence of Carbohydrates, Alkaloids, Glycosides, Flavonoids, Tannins, Proteins and steroids.

4.2. Physical appearance

Similar to other cosmetic products, people tend to evaluate the attractiveness of herbal hair oils based on their outward look, therefore maintaining a nice physical appearance is crucial. The color of the formed oil was a greenish yellow. The smell is nice. The oil was smooth and clear of extraneous objects.

4.3. pH

Using a pH meter, the pH of the herbal hair oil was ascertained. The formulation has a pH of 6.5. This displays the pH value's typical range.

4.4. Saponification value

Titration was used to assess the herbal hair oil's saponification property, and the results were really good. The formulation's saponification value is 7.298 mg/g.

4.5. Acid value

Titration analysis revealed a very good acid value for the herbal hair oil. There are 3.1416 mg/g of acid in the formulation.

4.6. Skin irritation test

After applying the prepared herbal hair oil on the hand, it was left in the sun for four to five minutes. It was determined that it wasn't irritating to the skin.

4.7. Specific gravity

After rinsing the specific gravity bottle with distilled water, it should be dried in an oven for fifteen minutes, cooled, then sealed with a cap and weighed [a]. Now pour the sample into the same specific gravity bottle, screw on the cover, and weigh it once again [b]. Subtract the weigh [b-a] to find the sample's weight per milliliter.

4.8. Evaluation of herbal hair oil

Table 3 Physical and Chemical Evaluation of Herbal Hair Oil

Parameters	Observation
Colour	Greenish yellow
Odour	pleasant
Consistency	Sticky in nature
pH	6.5
Density	0.96
Solubility	Soluble in non-polar solvents
Saponification value	7.293/1g
Acid value	3.1416mg
Skin irritation test	No irritation

5. Conclusion

Natural hair growth is encouraged by prepared herbal hair oils, which provide many vital elements needed to maintain the regular function of sebaceous glands. All hair values, including essential oils, minerals, and vitamins, are within permissible bounds. Some components are frequently found in herbal hair oil formulations, including as Mustard oil, coconut oil, and so on. For the first time, the formulation contains *cassia auriculata* leaves. The natural extract and components used for the hair oil technique were indicated to have properties that could manage hair fall and thickening, which when combined produced a complementary impact on the sale of vibrant, healthy hair. Elevate utilizing a unique herbal remedy with unique benefits. It is now shown that the procedure is safe for human application. recipe was completed and assessed using a variety of factors, including pH and organoleptic qualities (color, scent, sensitivity, sedimentation, acid cost, exact gravity, and balance check). Finally, it can be said that the natural hair oil compositions own a sizable first class.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] T.Usha Kiran Reddy, S. Rajesh, G.Sindhu, B.Aruna, Herbs Used in Formulating Poly-herbal Hair Oil- A Review, Indo American Journal Of Pharmaceutical Sciences ISSN:- 2349-7750
- [2] R.R Shah, S.A. Mohite, Preparation and evaluation of polyherbal hair oil- an effective cosmetic, Asian Journal of Pharmaceutical Research, ISSN: 2231-5691
- [3] X. Fatima Grace, S. Rahul Raj, S.Shanmughanathan, D. Chamundeeshwari, Preparation And Evaluation Of Polyherbal Hair Oil, ISSN: 2394-2789
- [4] Mr. Shrikant M. Madhekar, Mrs. Surekha S. Tayade, Ms. Vaishali N. Tidke, Formulation And Evaluation Of Poly-herbal Anti-dandruff Hair Oil: A Hair Care Preparation, Journal Of Emerging Technologies and Innovative Research, ISSN: 2349-5162
- [5] Swarnlata Saraf, Manjusha Jharaniya, Herbal Hair Cosmetics: Advancement and Recent Findings, World Journal of Pharmaceutical Research, ISSN: 2277-7105 13464
- [6] B. Ramya Kuber, Ch. Lavanya, Ch. Naga Haritha, S. Preethi, G. Rosa, Preparation and evaluation of poly herbal oil, Journal of Drug Delivery and Therapeutics, 2019; 9(1):68;73
- [7] Ramakrishna S,Naveenaradhya D,Namratha N.Y, Panchami D.K, Yashashwini, Moulya M.R, Formulation and Evaluation of Herbal Hair Oil,Unique Journal of Ayurvedic and Herbal Medicines 2021,09(05): 8-1