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Formulation and Evaluation of Herbal Hair Oil

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ABSTRACT

Murraya koenigii, or curry leaf, is recognized in Ayurvedic medicine for its potential benefits in promoting hair growth and improving scalp health. Research indicates that the plant is rich in bioactive compounds like alkaloids, flavonoids, and phenolic acids, which may enhance its therapeutic properties. Studies suggest that M. koenigii extract can increase hair follicle density and length, reduce hair loss by inhibiting 5-alpha-reductase, and improve scalp health through its anti-inflammatory and antimicrobial effects, thereby alleviating issues like dandruff and itchiness. Clinical trials support these findings, showing notable improvements in hair growth and scalp condition with the topical application of M. koenigii oil. The mechanisms thought to contribute to its effects include stimulation of hair follicles, enhanced blood circulation to the scalp, and antioxidant and anti-inflammatory activities. curry leaves are a common ingredient in Indian cooking, adding flavor to dishesh like curries rice, chutneys and soups. This is also used in aromatherapy, and health benefits including aiding digestion, reducing cholesterol, controlling diabetes and having anti-inflammatory properties

Keywords: Murraya koenigii, Curry leaf, Hair growth, Ayurvedic medicine, Bioactive compounds

INTRODUCTION

"Introducing a breakthrough herbal hair oil that leverages the combined strength of natural ingredients to foster healthy hair growth, texture, and strength. Our proprietary blend unites the time-tested principles of Ayurveda with modern hair care insights, showcasing the collaborative benefits of Curry Leaves, Castor Oil, Coconut Oil, and Kalonji Seeds. The antioxidant-rich Curry Leaves stimulate follicles, while Castor Oil's anti-inflammatory properties calm the scalp. Coconut Oil moisturizes and shields the hair, complemented by Kalonji Seeds' potent antioxidant and anti-inflammatory effects that promote scalp well-being. Our carefully balanced herbal hair oil addresses the underlying causes of hair loss, dullness, and damage. Regular use can: Enhance hair growth and density , Improve texture and shine , Reduce hair loss and break [1]

In the pursuit of healthy and beautiful hair, herbal hair oils have emerged as a natural and effective solution. For centuries, traditional systems of medicine such as Ayurveda have relied on the potent properties of herbs to promote hair growth, improve texture, and address various scalp issues.

Herbal hair oils are formulated by combining extracts of various herbs, each chosen for its unique benefits. These oils work by nourishing the scalp, stimulating hair follicles, and promoting a healthy environment for hair growth. [2]

The benefits of herbal hair oils are numerous :

- Promote hair growth and density
- Improve hair texture and shine

- Reduce hair loss and breakage
- Soothe and calm the scalp
- Address dandruff, itchiness, and other scalp issues
- Provide antioxidant protection to the hair and scalp

By harnessing the power of nature's finest herbs, herbal hair oils offer a safe, effective, and sustainable solution for achieving healthy and beautiful hair.

MATERIALS AND METHODS

Preparation of herbal extract :

Reflux Condensation :- Reflux condensation is a laboratory technique used to extract essential oils and bioactive compounds from plant materials. This process has been widely used in various studies, including those on curry leaves (Murraya koenigii) [3]

Equipment and Materials Needed:

1. Curry leaves (fresh or dried)
2. Solvent (ethanol, methanol, or hexane)
3. Round-bottom flask (500 mL or 1000 mL)
4. Reflux condenser
5. Heating mantle or hot plate
6. Thermometer
7. Magnetic stirrer (optional)
8. Filter paper and funnel

Procedure:

Step 1: Preparation of Curry Leaves

Weigh the required amount of curry leaves (e.g., 100 g). Dry fresh leaves in a hot air oven at 50°C for 2-3 hours or until moisture content is reduced. Grind dried leaves into a fine powder using a grinder or mortar and pestle

Step 2: Preparation of Solvent

Measure the required amount of solvent (e.g., 500 mL of ethanol). Ensure the solvent is of analytical grade and suitable for extraction

Step 3: Assembly of Reflux Condensation Apparatus

Connect the round-bottom flask to the reflux condenser. Ensure proper alignment and secure attachment. Connect the heating mantle or hot plate to the flask

Step 4: Extraction

Add ground curry leaves to the round-bottom flask. Pour solvent into the flask, ensuring leaves are completely submerged. Add a magnetic stirrer (if using). Heat mixture to desired temperature (e.g., 80°C) using heating mantle or hot plate. Maintain temperature for specified period (e.g., 2-3 hours). Stir occasionally for uniform extraction

Step 5: Reflux Condensation

Allow solvent vapor to rise into reflux condenser. Condenser cools vapor, causing condensation and flow back into flask. Repeat for specified period, allowing solvent to extract bioactive compounds

Step 6: Cooling and Filtration

Remove heat source and let mixture cool. Filter extract using filter paper and funnel. Discard solids and

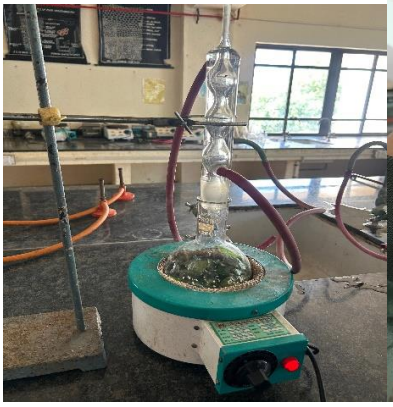
collect filtrate .

Step 7: Concentration (Optional)

Concentrate extract using rotary evaporator or vacuum evaporator (if desired). Remove solvent, leaving concentrated extract .

Step 8: Storage

Store extract in clean, dry container, protected from light and heat. Label container with date, extract details, and handling instructions . [4]



(Figure no. 1)

(Figure no. 2)

Chemical constituents

Table no. 1: chemical constituent and their role

Sr. no.	Chemical constituent	Role
1.	α-pinene	Stimulates hair growth by increasing blood flow to the scalp.
2.	β-pinene	Reduces inflammation on the scalp, promoting healthy hair growth.
3.	Sabinene	Antioxidant properties protect hair follicles from damage.
4.	Quercetin	Stimulates hair growth by increasing blood flow to the scalp and strengthening hair follicles.
5.	Kaempferol	Antioxidant properties protect hair follicles from damage and promote healthy hair growth.
6.	Mahanimbine	Stimulates hair growth by increasing blood flow to the scalp and strengthening hair follicles.
7.	Koenimbine	Antioxidant properties protect hair follicles from damage.
8.	Caffeic acid	Antioxidant properties protect hair follicles from damage and promote healthy hair growth.
9.	Ferulic acid	Stimulates hair growth by increasing blood flow to the scalp and strengthening hair follicles.

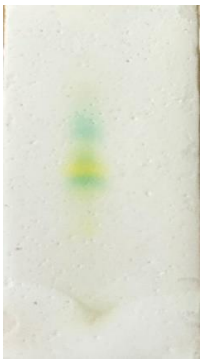
Thin plate chromatography (TLC) :-

TLC is a type of chromatography that separates mixtures based on the distribution of compounds between a stationary phase and a mobile phase.

Principle of TLC :-

TLC works on the principle of adsorption, where the compounds in the mixture interact with the stationary phase (silica gel or alumina) and the mobile phase (a solvent or mixture of solvents). [5]

(Figure no. 3)



(Figure no. 4)

TLC Procedure :-

Materials Needed :- TLC plate , Curry leaves extract , Mobile phase , Spray reagent , UV chamber , Microcapillary or TLC applicator , Chromatography chamber

Procedure :-

Step 1: Activate the TLC plate by heating.
Step 2: Dissolve curry leaves extract in a suitable solvent.
Step 3: Apply the sample solution onto the TLC plate.
Step 4: Place the TLC plate in a chromatography chamber and allow the solvent to rise.
Step 5: Observe the plate under UV light and spray with a suitable reagent.
Step 6: Record the Rf values and colors of the separated compounds.

Formulation of herbal hair oil

Table 1.2 composition of hair oil

Sr. no.	Name of ingredient	Role of ingredient	Importance
1	Coconut oil	Moisturizes, nourishes and protects hair	Promotes hair growth, reduces dandruff and soothes scalp irritation
2	Castor oil	Stimulates hair growth, reduces inflammation, and fights infections, silky hairs	Treats alopecia, dandruff, and scalp acne
3	Curry leaves	Enhance shine and texture, reduce hair fall, promotes hair growth and prevent premature graying	Rich in antioxidants, good source of vitamins and minerals, anti-inflammatory properties

4	Nigella sativa	Treats dandruff and scalp issues, enhance shine, texture and hair growth	Contain Antimicrobial properties, improve scalp circulation, natural conditioner

MANUFACTURING :-

Preparing curry leaves oil with coconut oil and other ingredients for hair is simple process that involves curry leaves in coconut oil. Following ingredients are used :

Ingredients:

1. 1 cup coconut oil
2. 1/2 cup fresh curry leaves (or 1/4 cup dried curry leaves)
3. 1/3 cup castor oil
4. 2 tablespoon nigella sativa
5. A clean glass jar with a lid
6. Cheesecloth or a coffee filter

There are 2 methods for preparing curry leaves oil:

Method 1: Heat Infusion

(Figure no. 5)
Heat infusion

Figure no. 6)
Cold infusion

1. Wash the curry leaves and dry them thoroughly In a saucepan, gently heat the coconut oil over low heat and then add castor oil.
2. Add the curry leaves to the warm oil and stir to combine and also add kalonji seeds.
3. Allow the mixture to simmer for about 30-40 minutes, watching for the oil to develop a greenish-yellow color.
4. Once infused, remove the saucepan from the heat and let the oil cool.
5. Strain the infused oil into a clean glass jar using cheesecloth or a coffee filter.
6. Discard the used curry leaves and kalonji seeds. [6]

This homemade curry leaves oil can be used for hair care, promoting health and shine.

Method 2: Cold Infusion

1. Rinse and dry the curry leaves thoroughly.
2. Place the curry leaves, nigella sativa, castor oil and coconut oil in a clean glass jar.
3. Seal the jar and store it in a cool, dark location.

4. Allow it to infuse for 2-3 weeks, shaking it daily.
5. Strain the oil through cheesecloth or a coffee filter into another clean jar.
6. Discard the used curry leaves and kalonji seeds. [6]

Tips and Variations:

1. Use fresh curry leaves for optimal potency.
2. Adjust the quantity of curry leaves based on your preference.
3. Consider adding herbs like neem, henna, or fenugreek for added benefits.
4. You can substitute coconut oil with a carrier oil such as olive or jojoba oil.
5. Store the final oil in an airtight container to keep it fresh.

Benefits of Curry Leaves Oil for Hair:-

Promotes Hair Growth-Supports healthy hair development, Reduces Hair Fall and Breakage- Strengthens hair to prevent loss, Improves Scalp Health- Nourishes the scalp for better condition, Enhances Shine and Texture- Adds luster and smoothness to hair, Treats Dandruff and Scalp Issues-Addresses dandruff and other scalp problems.

How to Use

1. Massage the oil into your scalp and hair.
2. Leave it on for 30 minutes to an hour.
3. Shampoo and condition as you normally would.
4. For optimal results, use once or twice a week.

Precautions

1. Conduct a patch test prior to use.
2. Allergic reactions are rare but may occur.
3. If you have sensitive skin or known allergies, consult a healthcare professional.

EVALUATION PARAMETERS

Physical Examination

1. Color: Observe the color of the hair oil using a colorimeter or by visual comparison with a standard color chart.
2. Clarity: Check the clarity of the hair oil by observing it against a light source.
3. Viscosity: Measure the viscosity of the hair oil using a viscometer.
4. Texture: Evaluate the texture of the hair oil by applying a small amount to the skin or hair.

pH Value Determination

1. Equipment: pH meter, pH buffer solutions (pH 4, 7, and 9)
2. Procedure: Calibrate the pH meter using pH buffer solutions. Measure the pH of the hair oil by dipping the pH electrode into the oil.
3. Acceptance criteria: pH range 4.5-6.5

Acid Value Determination

1. Equipment: Acid-value apparatus, phenolphthalein indicator
2. Procedure: Weigh 10g of hair oil into a flask. Add 10ml of ethanol and 1-2 drops of phenolphthalein indicator. Titrate with 0.1N KOH until the pink color persists.
3. Calculation: Acid value = (ml of KOH x N of KOH x 56.1) / weight of sample
4. Acceptance criteria: Acid value ≤ 2.0

Iodine Value Determination

1. Equipment: Iodine-value apparatus, Wijs solution
2. Procedure: Weigh 10g of hair oil into a flask. Add 10ml of Wijs solution and 10ml of chloroform. Allow to react for 30 minutes. Titrate with 0.1N Na2S2O3 until the yellow color disappears.
3. Calculation: Iodine value = (ml of Na2S2O3 x N of Na2S2O3 x 12.69) / weight of sample
4. Acceptance criteria: Iodine value ≤ 100

Peroxide Value Determination

1. Equipment: Peroxide-value apparatus, potassium iodide solution
2. Procedure: Weigh 10g of hair oil into a flask. Add 10ml of potassium iodide solution and 10ml of chloroform. Allow to react for 30 minutes. Titrate with 0.1N Na2S2O3 until the yellow color disappears.
3. Calculation: Peroxide value = (ml of Na2S2O3 x N of Na2S2O3 x 8.9) / weight of sample
4. Acceptance criteria: Peroxide value ≤ 10

Shelf Life and Storage Conditions

1. Storage conditions: Store the hair oil in a cool, dry place, away from direct sunlight.
2. Shelf life: Determine the shelf life of the hair oil by storing it under accelerated conditions (40°C ± 2°C, 75% RH ± 5%) for 6 months.
3. Evaluation: Evaluate the hair oil for physical, chemical, and microbiological changes at regular intervals (0, 3, and 6 months).
4. Acceptance criteria: The hair oil should not show any significant changes in physical, chemical, or microbiological properties during the shelf life study.

RESULT

physical parameters (Table 1.3)

Sr no.	Parameter	Observation
1	Color	Greenish-yellow to dark green
2	Viscosity	Thin to medium
3	Texture	Smooth, non-greasy
4	Odor	Characteristic curry leaves aroma
5	Specific gravity	0.9-1.1
6	Visual appeal	Clarity, color

Chemical parameters (Table 1.3)

Sr no.	Parameters	Observation
1	PH value	5.5-6.5
2	Acid value	5-10 mg KOH/g
3	Iodine value	100-150 g/100g
4	Peroxide value	5-10 mEq/kg

Stability parameters (Table 1.4)

Sr no.	Parameters	Observation
1	Shelf life	12-24 months
2	Storage condition	Cool, dry place, protected from sunlight

Formulation

(Figure no. 7)

DISCUSSION

Curry leaves oil has gained popularity due to its potential benefits for hair health. The oil, derived from the Murraya koenigii plant, contains vitamins A, B, C, and E, which support hair strength and health and the herbal hair oil formulation comprising curry leaves, kalonji seeds, coconut oil, and castor oil demonstrates potential in promoting hair growth, improving texture, and reducing hair fall. The synergistic combination of these herbal ingredients leverages their individual benefits, creating a comprehensive hair care solution.

Curry leaves, rich in antioxidants and essential nutrients, nourish the scalp and promote healthy hair growth. Kalonji seeds, with their anti-inflammatory and antifungal properties, help to soothe the scalp and prevent infections. Coconut oil and castor oil, with their moisturizing and emollient properties, hydrate and protect the hair, improving its texture and reducing breakage.

The herbal hair oil formulation offers a natural, safe, and effective alternative to synthetic hair care products. Regular use of this oil may lead to improved hair growth, reduced hair fall, and enhanced hair texture, ultimately promoting healthy and beautiful hair. Further studies can explore the optimal dosage, duration of treatment, and potential interactions with other hair care products."

Key Advantages

1. Nourishes the scalp and strengthens hair roots.
2. Promotes hair growth.
3. Rich in antioxidants, combating oxidative stress.
4. Possesses antimicrobial properties, alleviating scalp issues.

Curry leaves oil can be purchased or prepared at home by infusing fresh curry leaves in a carrier oil. Massaging the oil into the scalp promotes relaxation and nutrient absorption. Using curry leaves oil as a

pre-wash treatment or leave-in product may lead to significant improvements over time. This natural solution offers a powerful option with minimal side effects

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