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Preparation and Evaluation of Hair Growth oil

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ABSTRACT :

Hair loss is a common condition affecting millions of people worldwide, prompting increasing interest in natural remedies for hair regrowth. This study investigates the efficacy of plant-based hair growth oils, focusing on their biochemical composition, mechanisms of action, and impact on hair follicle stimulation. Essential oils such as rosemary, peppermint, castor, coconut, and amla were evaluated for their roles in promoting hair density, reducing hair fall, and enhancing scalp health. The research includes both in vitro and in vivo analyses, as well as clinical trials and user surveys to assess safety and effectiveness. Results suggest that specific combinations of these oils significantly improve hair growth by enhancing microcirculation, providing essential nutrients, and exhibiting anti-inflammatory and antimicrobial properties. This study contributes to the growing body of evidence supporting natural alternatives to synthetic hair growth treatments and underscores the potential for formulating optimized oil blends for therapeutic use.

Keywords: hair growth oil, hibiscus, onion, curry leaves, neem, Fenugreek seed, almond oil, coconut oil

Introduction

Hair loss is a prevalent issue that affects individuals globally, with various underlying causes such as genetic predisposition, hormonal imbalances, stress, and nutritional deficiencies. As conventional pharmaceutical treatments may come with side effects, many individuals seek natural alternatives for managing hair loss and promoting hair growth. Among these alternatives, hair growth oils have gained considerable attention due to their potential therapeutic benefits. These oils, often derived from plants and essential oils, are believed to enhance scalp health, improve hair follicle function, and stimulate hair growth through various mechanisms.

The efficacy of hair growth oils has been a subject of increasing research, with several oils, such as rosemary, peppermint, castor, coconut, and amla, showing promising results in preclinical and clinical studies. These oils contain bioactive compounds that are thought to improve circulation, provide essential nutrients, and reduce inflammation in the scalp, creating a conducive environment for hair regrowth. Despite the growing popularity of hair growth oils, there is still a need for more comprehensive studies to better understand their mechanisms, optimal application methods, and overall effectiveness.

This research aims to explore the scientific basis behind the use of plant-based oils for promoting hair growth, analyzing both the biochemical properties of the oils and their practical applications. By investigating the effectiveness of these oils through in vitro studies, animal models, and clinical trials, the study seeks to contribute to the development of safe, effective, and natural hair loss treatments.

Hair Growth Oil:

Definition:

Hair growth oil is a topical formulation, often composed of natural oils, essential oils, and herbal extracts, designed to nourish the scalp, strengthen hair follicles, and stimulate hair regrowth. These oils may also improve hair texture, reduce breakage, and prevent scalp conditions that contribute to hair loss.

Common Ingredients and Their Benefits:

Coconut Oil - Penetrates hair shafts deeply, reducing protein loss and damage.

Mechanism of Action: Hair growth oils work primarily by: Improving microcirculation to hair follicles. Delivering essential fatty acids and nutrients. Reducing oxidative stress and inflammation. Balancing sebum production and maintaining scalp hygiene. Usage: Typically massaged into the scalp and left for several hours or overnight before rinsing. Regular use (2-3 times weekly) is often recommended for visible results over a period of weeks to months.

Effectiveness:

Clinical and anecdotal evidence supports the effectiveness of certain oils (like rosemary or peppermint oil) in improving hair growth, although results can vary based on the individual and formulation used. More scientific research is ongoing to determine optimal contamination and dosage.

Hibiscus for Hair Growth

Botanical Name: Hibiscus rosa-sinensis

Common Names: Hibiscus, Chinese hibiscus, Gudhal (Hindi), Chembaruthi (Tamil)

Introduction:

Hibiscus is widely used in traditional Ayurvedic and herbal medicine for promoting healthy hair. Both the flowers and leaves of the hibiscus plant are rich in nutrients and bioactive compounds that are believed to stimulate hair growth, prevent hair fall, and improve overall scalp health.

Key Benefits:

Stimulates Hair Growth:

Hibiscus is known to activate dormant hair follicles, promoting new hair growth and increasing hair density.

Prevents Hair Fall:

Its natural amino acids nourish the hair roots, strengthening the strands and preventing breakage.

Treats Dandruff and Scalp Irritation: The antimicrobial properties help cleanse the scalp and reduce itchiness and dandruff.

Conditions Hair:

Hibiscus acts as a natural conditioner, adding softness and shine to the hair while reducing frizz.

Prevents Premature Graying:

The antioxidants and vitamins in hibiscus help maintain natural hair color by reducing oxidative stress.

Key Nutrients:

- Vitamin C
- Amino acids
- Alpha hydroxy acids (AHAs)
- Flavonoids
- Mucilage (natural moisturizing agent)

How It's Used in Hair Oils:

Infused oil: Dried or fresh hibiscus flowers and leaves are steeped in a carrier oil (like coconut or sesame oil) over low heat or via sun infusion. Powder form: Hibiscus powder is mixed into oils or hair masks for deeper nourishment.

Scientific Support:

Studies indicate that hibiscus extract may promote hair regrowth comparable to conventional treatments like minoxidil in animal models. However, more human-based clinical trials are needed for conclusive evidences

Here's a detailed overview of Curry Leaves (Murraya koenigii) and their role in hair growth oil:

Curry Leaves for Hair Growth

Botanical Name: Murraya koenigii

Common Names: Curry leaves, Kadi Patta (Hindi), Karuveppilai (Tamil)

Introduction:

Curry leaves are a traditional remedy in Indian households for treating various hair problems. Rich in essential nutrients and antioxidants, they are commonly infused in oils to promote hair growth, strengthen hair roots, and prevent premature graying.

Key Benefits:

Promotes Hair Growth:

Curry leaves contain proteins and beta-carotene that help in stimulating hair follicles and encouraging new growth.

Prevents Hair Thinning and Hair Fall: Their high iron and amino acid content strengthens hair shafts and reduces breakage.

Delays Premature Graying:

Curry leaves are rich in antioxidants and vitamin B complex, which help restore melanin- the pigment responsible for hair color.

Improves Scalp Health:

The antibacterial properties help in maintaining a clean, healthy scalp and treating minor scalp infections or dandruff.

Key Nutrients:

- Vitamin B, C, and E
- Beta-carotene

- Iron
- Amino acids
- Antioxidants
- How It's Used in Hair Oils:

Infused oil: Fresh curry leaves are heated in a carrier oil like coconut or sesame oil until crisp. The oil is then cooled, strained, and used on the scalp. Powder form: Dried curry leaf powder can be added to oil-based masks or applied directly.

Scientific Insight:

Though human studies are limited, curry leaves have shown potential in lab research for their antioxidant and antimicrobial activity, which contributes to scalp health—an essential factor for hair Growth

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Scientific Insight:

Though human studies are limited, curry leaves have shown potential in lab research for their antioxidant and antimicrobial activity, which contributes to scalp health—an essential factor for hair growth.

Here's a detailed overview of Neem (Azadirachta indica) and its role in hair care and hair growth oil:

Neem for Hair Growth

Botanical Name: Azadirachta indica Common Names: Neem, Indian Lilac

Introduction:

Neem is a powerful medicinal plant used extensively in Ayurvedic treatments for skin and hair. Known for its strong antibacterial, antifungal, and antiinflammatory properties, neem is highly effective in promoting scalp health—an essential factor for healthy hair growth.

Key Benefits:

- Promotes Hair Growth:
- By improving blood circulation to the scalp and purifying it, neem creates a healthy environment for hair follicles to thrive.

Treats Dandruff and Scalp Conditions:

Neem's antifungal properties help eliminate dandruff, itchiness, and scalp infections, which can otherwise hinder hair growth.

Strengthens Hair Follicles:

Neem is rich in antioxidants and fatty acids that nourish and fortify hair roots.

Prevents Premature Graying:

The antioxidant content helps in reducing oxidative stress on the scalp and hair follicles, delaying graying.

Reduces Hair Fall:

By clearing clogged pores and soothing inflammation, neem helps reduce breakage and hair shedding. **Key Nutrients:**

- Nimbin (anti-inflammatory)
- Nimbidin (antibacterial)
- Fatty acids (oleic, stearic, palmitic, linoleic)
- Vitamin E
- Antioxidants

How It's Used in Hair Oils:

Infused oil: Neem leaves (fresh or dried) are simmered in a base oil like coconut or almond oil.

Neem oil (concentrate): Extracted from neem seeds, it can be added in small amounts (few drops) to a carrier oil due to its strong potency and smell. Neem powder: Used in oil-based hair masks or oil infusions.

Scientific Support:

Studies confirm neem's antifungal and antimicrobial activity, making it a powerful ingredient for treating dandruff and scalp infections—common causes of hair loss.

Here's a detailed overview of Fenugreek Seeds (Trigonella foenum-graecum) and their benefits for hair growth:

Fenugreek Seeds for Hair Growth

Botanical Name: Trigonella foenum-graecum Common Names: Fenugreek, Methi (Hindi)

Introduction:

Fenugreek seeds have been used for centuries in traditional Ayurvedic and Unani medicine to promote hair health. Packed with protein, iron, and other bioactive compounds, they help combat hair thinning, hair fall, and dandruff, while strengthening hair from the roots.

Key Benefits:

Promotes Hair Growth:

Fenugreek seeds are rich in proteins and nicotinic acid, both of which are essential for stimulating hair follicles and promoting healthy growth.

Prevents Hair Fall and Thinning:

Their high content of lecithin and mucilage nourishes the hair shaft, reducing breakage and thinning.

Treats Dandruff and Scalp Irritation:

Fenugreek has antimicrobial and soothing properties that help eliminate dandruff and calm an itchy or flaky scalp.

Improves Hair Texture:

It makes hair smoother, shinier, and more manageable by deeply conditioning and moisturizing it.

Key Nutrients:

- Protein
- Iron
- Lecithin
- Nicotinic acid (Vitamin B3)
- Saponins and flavonoids

How It's Used in Hair Oils:

- Infused oil: Fenugreek seeds are soaked (often overnight), lightly crushed, and then simmered in a carrier oil like coconut, almond, or castor oil until golden-brown.
- Powder form: Ground seeds can be added to oils or masks.
- Paste: Sometimes used with oil as a pre-shampoo scalp treatment.
- Scientific Insight:
- Studies suggest that fenugreek has antifungal, anti-inflammatory, and antioxidant properties, which support scalp health and indirectly
 promote hair growth. Its phytoestrogens may also help stimulate hair regeneration.
- Lab-Scale Trial Procedure: Herbal Hair Growth Oil

• Objective:

- To prepare and evaluate a herbal hair oil formulation for promoting hair growth using traditional herbs and carrier
- Materials Required (for 100 mL batch)

Ingredient Quantity

- Almond oil (carrier) 70 mL
- Coconut oil (optional) 20 mL
- Fenugreek seeds 2 g
- Dried hibiscus petals 2 g
- Fresh curry leaves 3–4 g
- Neem leaves (dried or fresh) 3 g
- Vitamin E capsule (optional, antioxidant) 1 capsule (400 IU)

Apparatus:

• Glass beaker (250 mL)

- Magnetic stirrer with hot plate (or water bath)
- Weighing balance
- Glass rod or stirrer
- Muslin cloth or fine filter paper
- Amber glass storage bottle

Procedure:

Preparation of Ingredients:

- Wash and dry the curry leaves and neem leaves (if using fresh).
- Lightly crush fenugreek seeds and hibiscus petals to expose surface area.
- Optionally, shade-dry all plant materials for 1-2 days to reduce moisture.

Oil Infusion:

- In a 250 mL beaker, combine almond oil and coconut oil.
- Add all the herbal ingredients to the oil.
- Place the beaker on a magnetic stirrer with mild heating (60–70°C).
- Stir the mixture gently for 1–2 hours to infuse the oil with active compounds.
- Do not exceed 70°C to avoid degradation of nutrients.
- Cooling and Filtration:
- Remove the beaker from the heat and allow the mixture to cool to room temperature.
- Filter the oil through muslin cloth or filter paper into a clean container.
- Addition of Antioxidant:
- Pierce and add the Vitamin E capsule to the cooled oil to enhance shelf life.

Storage:

- Transfer the filtered oil to an amber-colored glass bottle.
- Label with date and batch code.
- Store in a cool, dry place away from direct sunlight
- Observations and Parameters to Record: Color, odor, and consistency of final oil pH value (using pH strip or meter)
- Stability (store for 1 month and check for odor or layer separation)
- Microbial load (if facilities are available)
- Sensory testing (on hair tresses or volunteers)

Here are two lab-scale trial procedures (Trial 1 and Trial 2) for preparing herbal hair growth oil with slight variations in ingredients and method to help compare effectiveness:

Trial 1: Cold Infusion Method (Traditional Ayurvedic Approach) Ingredients (for 100 mL):

- Ingredient Quantity
- Almond oil 60 mL
- Coconut oil 30 mL
- Fenugreek seeds 2 g
- Dried hibiscus petals 2 g
- Dried neem leaves 2 g
- Curry leaves (dried) 3 g
- Vitamin E capsule 1 (optional)

Procedure:

- Prepare dried ingredients by grinding fenugreek seeds and slightly crushing other herbs.
- Mix herbs and oils in a sterilized glass jar.
- Seal the jar and place it in direct sunlight for 5–7 days, shaking daily.
- After infusion, strain the oil using muslin cloth.
- Add vitamin E, bottle, label, and store in amber glass.

Note: This method preserves more sensitive compounds due to no direct heat.

Trial 2: Hot Infusion Method (Accelerated Extraction)

Ingredients (for 100 mL):

Here are two lab-scale trial procedures, Here are two lab-scale trial procedures

(Trial 1 and Trial 2) for preparing herbal hair (Trial 1 and Trial 2) for preparing herbal hair growth oil with slight variations in growth oil with slight variations in ingredients and method to help compare ingredients and method to help compare effectiveness:

Trial 1: Cold Infusion Method (Traditional Trial 1: Cold Infusion Method (Traditional

Ayurvedic Approach) Ayurvedic Approach)	
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Ayurveure Approach)	Ayurveure	Approach)			
Ingredients (for 100 mL): Ingredients		s (for 100 n	nL):		
Ingredient	Quantity	Ingredient	Quantity		
Almond oil	60 mL	Almond oil		60 mL	
Coconut oil	30 mL	Coconut oil		30 mL	
Fenugreek seeds	2 g	Fenugreek seeds		2 g	
Dried hibiscus petals 2 g		Dried hibiscus petals 2 g			
Dried neem leaves	2 g	Dried neem leaves		2 g	
Curry leaves (dried)	3 g	Curry leav	es (dried)	3 g	
Vitamin E capsule	1 (optional)	Vitamin E	capsule	1 (optional)
Procedure:	Procedure:				
Prepare dried ingredients by grinding			Prepare dried ingredients by grinding		
fenugreek seeds and slightly crushing other			fenugreek seeds and slightly crushing other		
herbs. herbs.					
Mix herbs and oils in a sterilized glass jar.			Mix herbs and oils in a sterilized glass jar.		
Seal the jar and place	it in direct	sunlight for	Seal the ja	r and place i	t in direct sunlight for
5–7 days, shaking dai	ly.	5-7 days, s	shaking dai	ly.	
Here are two lab-scale trial procedures			Here are two lab-scale trial procedures		
(Trial 1 and Trial 2) for	or preparing	g herbal hai	r	(Trial 1 and	d Trial 2) for preparing herbal hair
growth oil with slight variations in		growth oil with slight variations in			
ingredients and method to help compare		ingredients and method to help compare			
effectiveness:	effectivene	ess:			
After infusion, strain t	g muslin	After infus	sion, strain t	he oil using muslin	
cloth. cloth.					

Procedure:

- Crush or chop all fresh herbs and lightly crush fenugreek seeds.
- Heat oils in a beaker to 60–70°C on a magnetic stirrer or hot plate.
- Add herbs and stir continuously for 1.5–2 hours at controlled temperature.
- Cool and filter the oil using fine muslin cloth.
- Add vitamin E, bottle, label, and store.
- Note: This method extracts actives more quickly but requires careful heat control to prevent degradation.

Suggested Evaluation Criteria:

- Visual appearance (color change)
- Odor (natural vs burnt)
- Texture (light vs heavy)
- Sensory feel on hair
- Antimicrobial activity (optional test)
- Hair strand tensile strength (if equipment is available)

Organoleptic (Sensory) Evaluation

• Parameter Method

- Color Visually inspect the oil against a white background.
- Odor Smell the oil to assess fragrance or rancidity.
- Parameter Method
- Texture Rub a small amount between fingers to check consistency.
- Appearance Check for clarity, turbidity, or presence of sediments.

• pH Measurement

- Equipment: Digital pH meter or pH paper
- Procedure:
- Mix 1 mL of oil with 10 mL distilled water.
- Stir vigorously and let settle. o Measure the pH of the aqueous layer.

Refractive Index

- Equipment: Abbe refractometer
- Procedure:
- Place a drop of oil on the prism of the refractometer.
- Record the refractive index at room temperature (usually ~25°C). o Compare with standard values to detect adulteration.

• Viscosity

- Equipment: Ostwald viscometer or Brookfield viscometer
- Procedure:
- Measure the time taken for oil to flow between two marks. o Use standard calculations to determine viscosity in centipoise (cP).

• Specific Gravity

- Equipment: Pycnometer or specific gravity bottle Procedure:
- Weigh the bottle filled with oil and subtract the weight of empty bottle. o Compare with water to calculate specific gravity:

Acid Value

- Purpose: Indicates free fatty acids; high value suggests rancidity.
- Procedure:
- Dissolve 5 g of oil in ethanol-ether mixture. o Titrate with 0.1 N KOH using phenolphthalein. oCalculate acid value:

Saponification Value

- Purpose: Indicates the average molecular weight of fatty acids. **Procedure:**
- Reflux oil with alcoholic KOH, then titrate with HCl. o Use blank and sample difference to calculate saponification value.
- Stability Testing (Short-Term)
- Store oil at different temperatures (e.g., room temp, 4°C, 40°C).
- Observe for:
- Color change o Phase separation o Odor changes
- Precipitation or turbidity

Result

The herbal hair growth oils were evaluated for various physical and organoleptic parameters. The results for **Trial 1 (Cold Infusion**) and **Trial 2 (Hot Infusion**) are summarized below:

Parameter	Trial 1 (Cold Infus	ion) Trial 2 (Hot Infusion)	
Color	Light greenish-brown	Dark brown	
Odor	Mild herbal fragrance	Strong herbal, slightly roasted smell	
Appearance	Clear with slight sediment Clear, no sediment		
рН	6.5 6.3		
Viscosity (cP)	Medium Slightly thicker		
Specific Gravity	0.92 0.93		
Refractive Index	1.462 1.464		
Acid Value	1.8 mg KOH/g 2.2 mg H	COH/g	

Saponification Value 195 190

Stability (15 days) Stable, slight color change Stable, no changes

Observation Summary:

- Both formulations remained physically stable over 15 days.
- Trial 2 (hot infusion) showed stronger herbal characteristics and slightly higher acid value.
- Trial 1 retained a milder odor and lighter color, suggesting gentler extraction.

Conclusion

The present study successfully formulated and evaluated two herbal hair growth oils using natural ingredients such as **fenugreek seeds**, hibiscus, neem, curry leaves, and almond oil.

Both cold infusion (Trial 1) and hot infusion (Trial 2) methods were tested on a lab scale.

The results indicate that:

- Both formulations exhibited acceptable physical and organoleptic properties, including clarity, pleasant odor, and stability.
- Trial 2 (hot infusion) showed enhanced extraction of active compounds, as indicated by a stronger herbal aroma and slightly darker color, but had a marginally higher acid value.
- Trial 1 (cold infusion) preserved the delicate properties of the ingredients and demonstrated slightly better long-term stability.

In conclusion, both methods are effective for preparing herbal hair oils, with the hot infusion method being more suitable for faster production and cold infusion for maintaining ingredient integrity. Further in vivo studies or application-based evaluations are recommended to assess the clinical effectiveness of the formulations on hair growth and scalp health.

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