IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

"Formulation & Evaluation of Herbal Hair Spray for Hair Rejuvenation & Hair Care"

Mr. Aftab Akram Khan[1], Miss Muskan Manoruddin Mallick[2], Mr. Minhaj M. Shaikh[3]
Mr. Aditya G. Kadam[4], Mr. Swapnil B. Tatewar[5]
[1234]UG Scholar, Dept of Pharmaceutics, Ishwar Deshmukh Institute of Pharmacy, Digras, India
[5]Assistant Professor, Dept of Pharmaceutics, Ishwar Deshmukh Institute of Pharmacy, Digras, India

Abstract: *Hair-related problems such as excessive hair fall, thinning, dandruff, and scalp infections have become increasingly common due to various lifestyle choices, poor nutrition, environmental pollution, and frequent use of chemical-laden hair products. These issues often lead individuals to seek natural and safer alternatives for hair care. Herbal remedies have gained widespread acceptance due to their effectiveness, minimal side effects, and traditional usage in various systems of medicine like Ayurveda. This study aims to formulate and evaluate a herbal hair spray designed specifically for hair rejuvenation. The formulation includes seven medicinal plants known for their beneficial effects on hair and scalp health: Coriandrum sativum (Coriander), Nigella sativa (Black cumin), Centella asiatica (Gotu kola), Phyllanthus emblica (Amla), Azadirachta indica (Neem), Trigonella foenum-graecum (Fenugreek), and Murraya koenigii (Curry leaves). These herbs are traditionally used to strengthen hair roots, reduce hair fall, prevent scalp infections, and improve overall hair texture and shine. Each ingredient is rich in natural compounds such as antioxidants, vitamins (especially vitamin C and beta-carotene), flavonoids, and essential oils that promote hair growth and protect the scalp from microbial infections and oxidative stress. The formulation process involved the preparation of individual herbal extracts, which were then blended in optimal ratios and combined with natural preservatives and moisturizing agents. The final herbal spray was subjected to evaluation for key parameters including physical appearance, pH, sprayability, and stability under different conditions. Additionally, user satisfaction was assessed through a small-scale trial. The results indicated that the spray was well-tolerated, stable, and effective in enhancing hair quality. Overall, the formulated herbal hair spray shows significant promise as a natural, holistic solution for hair rejuvenation and scalp care.*

Keywords: Herbal hair spray, Hair Rejuvination, Scalp Infection, Medicinal Plant, etc

I. INTRODUCTION

Hair fall and scalp-related disorders are often linked to poor scalp hygiene, oxidative stress, microbial infections, and nutrient deficiencies. The scalp, being the foundation for healthy hair growth, requires an optimal balance of moisture, sebum regulation, and proper blood circulation to maintain healthy follicles. Disturbance in any of these factors can lead to weak hair shafts, loss of hair density, and poor hair texture.

To address these issues, many individuals are turning to natural and holistic remedies, especially herbal treatments. Herbal medicine has been an integral part of traditional healing systems such as Ayurveda, Unani, and Traditional Chinese Medicine for centuries. These systems utilize plant-based formulations that harness the therapeutic properties of herbs to restore health and balance. In the context of hair care, numerous herbs are known to strengthen hair follicles, reduce dandruff, improve blood flow to the scalp, and provide essential nutrients required for hair regeneration.

Unlike chemical-based hair care products that may yield short-term benefits but often result in long-term side effects like dryness, irritation, or hormonal disruptions, herbal hair formulations offer a safer and more sustainable alternative. The bioactive compounds found in medicinal plants, such as flavonoids, alkaloids, essential oils, vitamins, saponins, and tannins, are known to promote hair growth, fight infections, and combat oxidative stress—all of which contribute to healthier, stronger hair.

Copyright to IJARSCT
www.ijarsct.co.in
DOI: 10.48175/IJARSCT-26726

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

This study aims to formulate and evaluate a novel herbal hair spray by incorporating a synergistic blend of seven well-known hair-beneficial herbs: Coriandrum sativum (Coriander), Nigella sativa (Black cumin), Centella asiatica (Gotu kola), Phyllanthus emblica (Amla), Azadirachta indica (Neem), Trigonella foenum-graecum (Fenugreek or Methi), and Murraya koenigii (Curry leaves). Each of these herbs has been traditionally used in various cultures for hair and scalp health, and modern research supports many of their claimed benefits.

Coriander (Coriandrum sativum) contains essential oils and antioxidants that help stimulate the scalp, reduce dandruff, and improve hair texture.

Fig 1: Crude Drug of Coriander ***(Coriandrum sativum)***

Black cumin (Nigella sativa) is rich in thymoquinone, which has anti-inflammatory and antioxidant properties that can improve scalp health and encourage follicular regeneration.

Fig 2: Crude Drug of Black cumin **(*Nigella sativa*)**

Gotu kola (Centella asiatica) is known to improve blood circulation, which is crucial for nutrient delivery to the hair roots and for promoting hair growth.

Fig 3: Crude Drug of Gotu kola (*Centella asiatica*)

Copyright to IJARSCT
www.ijarsct.co.in
DOI: 10.48175/IJARSCT-26726

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

Amla (Phyllanthus emblica) is a potent source of Vitamin C and antioxidants, which help in collagen synthesis and reduce premature greying.

Fig 4: Crude Drug of Amla **(*Phyllanthus emblica)***

Neem (Azadirachta indica) has strong antimicrobial and antifungal properties that are effective in treating dandruff and soothing an itchy scalp.

Fig 5: Crude Drug of Neem **(Azadirachta indica)**

Fenugreek (Trigonella foenum-graecum) is a rich source of proteins and nicotinic acid, known to strengthen hair shafts and prevent breakage.

Fig 6: Crude Drug of Fenugreek **(*Trigonella foenum-graecum)***

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

Curry leaves (Murraya koenigii) are packed with beta-carotene and amino acids, which help prevent hair thinning and restore natural pigment to the hair.

Fig 7: Crude Drug of Curry leaves (***Murraya koenigii***)

Brahmi (Bacopa monnieri) is rich in bacosides and antioxidants, which strengthen hair follicles, reduce hair thinning, and promote scalp health. These compounds enhance blood circulation to the scalp, supporting hair growth and helping maintain natural hair pigment to prevent premature greying.

Fig 8: Crude Drug of Brahmi (***Bacopa monnieri***)

The formulation of a spray format is particularly advantageous due to its ease of application, non-greasy feel, and the ability to deliver active ingredients directly to the scalp and hair roots without heavy buildup. Moreover, a water-based or hydroalcoholic spray ensures quick absorption and enhanced penetration of herbal extracts into the scalp layers.

In this research, the herbal extracts were prepared using traditional decoction and maceration techniques to preserve their active phytoconstituents. The combined extract was then formulated into a sprayable liquid, supplemented with natural preservatives and mild moisturizers to enhance shelf life and user experience. The spray was evaluated based on several critical parameters such as appearance, odor, pH, viscosity, sprayability, and stability under accelerated storage conditions.

In addition to physicochemical evaluations, sensory feedback from volunteers was collected to assess the product's effectiveness in real-world use. This feedback covered aspects such as improvement in hair texture, reduction in hair fall, ease of application, and user satisfaction over a period of consistent use.

In conclusion, this study presents an effort to bridge traditional herbal knowledge with modern cosmetic formulation techniques. By harnessing the collective benefits of multiple hair-friendly herbs in a convenient spray form, the aim is to offer a natural, side-effect-free, and affordable solution for common hair problems faced by people today. This multi-herbal formulation may serve as a promising alternative to chemical treatments, paving the way for future development in herbal cosmetic science.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

Common Hair Problems and Their Causes

Table no 1: Common Hair Problems and Their Causes		
Condition	Causes	Symptoms
Hair fall / Alopecia	Genetics, hormonal imbalance, stress, poor nutrition, medications	Excessive shedding, bald patches
Dandruff	Fungal infections (Malassezia), dry scalp, overproduction of sebum	Flaking, itching, irritation
Premature greying	Oxidative stress, genetic predisposition, vitamin B12 deficiency	Grey or white hair before the age of 30
Split ends / Breakage	Overstyling, chemical damage, UV exposure	Brittle hair, fraying ends
Thinning	Aging, poor scalp circulation, inflammation	Visible scalp, decreased hair density

Pharmacology of Herbal Ingredients Used

Table no2 : Pharmacology of Herbal Ingredients Used			
Herb	Scientific Name	Active Compounds	Pharmacological Actions
Coriander	Coriandrum sativum	Linalool, flavonoids	Antifungal, anti-inflammatory, improves scalp health
Black cumin	Nigella sativa	Thymoquinone, nigellone	Antioxidant, antibacterial, promotes follicular health
Gotu kola	Centella asiatica	Asiaticoside, madecassoside	Enhances microcirculation, anti-inflammatory, stimulates fibroblasts
Amla	Phyllanthus emblica	Vitamin C, tannins, gallic acid	Antioxidant, promotes collagen synthesis, delays greying
Neem	Azadirachta indica	Nimbin, nimbidin, azadirachtin	Antifungal, antiseptic, treats dandruff and scalp infections
Fenugreek (Methi)	Trigonella foenum-graecum	Saponins, diosgenin, nicotinic acid	Hair softening, strengthens roots, prevents breakage
Curry Leaves	Murraya koenigii	Beta-carotene, amino acids	Stimulates melanin production, improves hair strength and shine
Bramhi	Bacopa monnieri	Bacosides A& B (bramhine, herpestine), Saponins.	Cognitive enhancement, neuroprotrction, anxiolytic effect, may promote hair growth & reduce strees-related hair loss

Mechanism of Action of Herbal Hair Spray

Herbal hair sprays leverage the therapeutic properties of medicinal plants to support hair health, address scalp concerns, and stimulate hair growth through a variety of biochemical mechanisms. The key actions are as follows:

1. Antioxidant Action

Ingredients: Amla (Indian Gooseberry), Black Cumin (Nigella sativa), Curry Leaves

These herbs are rich in potent antioxidants such as vitamin C, polyphenols, and flavonoids. Antioxidants neutralize free radicals—unstable molecules that cause oxidative stress and contribute to the degradation of hair follicle cells. This oxidative stress can lead to weakened follicles, hair thinning, and premature greying. By reducing this damage, these herbs:

- Help maintain the integrity and strength of hair follicles.
- Slow down the aging process of hair.
- Support melanin production, which maintains natural hair color.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

2. Microbial Control

Ingredients: Neem (Azadirachta indica), Coriander (Coriandrum sativum)

Neem and coriander have been widely recognized in Ayurvedic and traditional medicine for their strong antimicrobial properties. They contain compounds like nimbidin, quercetin, and essential oils that:

• Exhibit antifungal and antibacterial activity.

• Help manage conditions like dandruff, seborrheic dermatitis, and fungal infections.

• Maintain a clean and healthy scalp environment, reducing the likelihood of inflammation, irritation, and follicular blockage caused by microbial overgrowth.

3. Nourishment & Moisturization

Ingredients: Fenugreek (Trigonella foenum-graecum), Coriander

Fenugreek seeds are rich in mucilage, proteins, nicotinic acid, and lecithin, which are beneficial for both hair and scalp. Coriander complements this with its essential oils and anti-inflammatory effects. Together, they:

• Deeply hydrate the scalp and prevent dryness, flakiness, and itchiness.

• Soothe irritated skin, reducing inflammation and redness.

• Strengthen the hair shaft by providing proteins and essential nutrients.

4. Follicular Stimulation

1. Ingredient: Gotu Kola (Centella asiatica)

Gotu kola is known for its adaptogenic and circulatory-stimulating properties. It improves microcirculation in the scalp by promoting the dilation of blood vessels and enhancing collagen synthesis. This action:

• Increases the delivery of oxygen and nutrients to the hair roots.

• Stimulates dormant follicles and encourages the transition of hair from the resting (telogen) to the growing (anagen) phase.

• Enhances overall hair density and growth rate over time.

2. Objectives

• To formulate a stable herbal hair spray using selected medicinal herbs.

• To evaluate its physical, chemical, and sensory properties.

• To assess its effectiveness in promoting healthy hair growth.

III. MATERIALS AND METHODS

3.1 Extraction Method

Fig 8: Maceration of all the Herbs used

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 6, May 2025 Impact Factor: 7.67

1. Coriander (Coriandrum sativum) – Seed or Leaf

Grind dried coriander seeds or leaves into a coarse powder. Soak 1 part of the powder in 5 parts of ethanol or a 50:50 ethanol-water mix. Let it sit for 24–48 hours in a covered jar, shaking occasionally. Strain through a fine cloth. This captures essential oils like linalool, as well as flavonoids and antioxidants that help reduce scalp inflammation and combat microbial growth. Coriander extracts are commonly used in hair care for their antifungal and refreshing properties.

2. Black Cumin (Nigella sativa) – Seed

Lightly roast black cumin seeds (optional) and grind them coarsely. Soak in warm oil (like coconut or olive oil) in a 1:5 ratio. Heat gently on low flame (double boiler recommended) for 30–45 minutes, then let it cool. Strain and store. Black cumin seed oil is rich in thymoquinone, a powerful antioxidant and anti-inflammatory agent. This infused oil supports scalp health, reduces dandruff, and may help stimulate hair regrowth by improving follicle nourishment and reducing oxidative stress.

3. Gotu Kola (Centella asiatica) – Leaf Powder

Use dried Gotu kola leaves and crush them gently. Soak 1 part of the leaves in 5 parts of ethanol or a 70% hydroalcoholic solution. Let it steep for 2 days, shaking occasionally. Strain the liquid to obtain a triterpenoid-rich extract. Gotu kola promotes collagen synthesis and microcirculation in the scalp, which enhances the delivery of oxygen and nutrients to the follicles, encouraging healthier hair growth and reducing thinning.

4. Amla (Phyllanthus emblica) – Powder

Dry amla pieces or use powder. Boil 1 part of dried amla in 5 parts of water for 15–20 minutes, then let it steep for an hour. Strain through cloth or sieve. This aqueous decoction preserves vitamin C, gallic acid, and tannins, all of which strengthen hair roots, prevent premature greying, and act as powerful antioxidants. Regular use of amla extract in hair products helps maintain a healthy scalp and shiny, strong hair.

5. Neem (Azadirachta indica) – Leaf

Crush fresh or dried neem leaves. Simmer in water (1:5 ratio) for 15–20 minutes or soak overnight in cold water. Strain to use the antimicrobial-rich aqueous extract. For oil-soluble actives, soak leaves in warm sesame or coconut oil over low heat for 1 hour, then strain. Neem contains azadirachtin and nimbin, which are potent antifungal and antibacterial compounds. It helps treat scalp infections, dandruff, and lice while maintaining a clean, balanced scalp environment.

6. Fenugreek (Methi, Trigonella foenum-graecum) – Seed

Soak fenugreek seeds in warm water overnight (1:5 ratio). In the morning, grind into a gel-like paste or strain the mucilaginous extract. This provides moisturizing mucilage and anti-inflammatory benefits. Fenugreek also contains nicotinic acid, proteins, and saponins, which nourish the scalp, reduce hair fall, and improve texture. The extract can be used as a natural conditioner or mixed into sprays and masks.

7. Curry Leaves (Murraya koenigii) – Leaf

Grind fresh or dried curry leaves. Simmer in water or oil (coconut or sesame oil) for 20–30 minutes on low heat. Let cool and strain. The extract contains essential oils, alkaloids, and antioxidants that support hair pigmentation, strengthen follicles, and reduce hair loss. Curry leaves are traditionally known to prevent premature greying and promote stronger, shinier hair by nourishing the roots with iron, calcium, and amino acids.

8. Brahmi Powder (Bacopa monnieri) – Herb

Grind dried Brahmi leaves or whole plant into a fine powder. Mix with water, coconut oil, or aloe vera gel to form a paste, or simmer in water/oil for 20–30 minutes on low heat to create an extract. Let cool and strain if using oil/water. The extract contains bacosides, alkaloids, and antioxidants that enhance scalp circulation, strengthen hair follicles, and

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

promote hair growth. Brahmi is traditionally known to reduce hair fall, prevent premature greying, and nourish the scalp with its cooling properties, improving hair thickness and luster.

3.2 Formulation Process

1. Weigh and Clean Herbs:
o Accurately weigh all herbs using a digital scale.
o Rinse fresh leaves like curry leaves under clean water; pat dry.
2. Pre-Process Seeds:
o Lightly crush fenugreek, coriander, and black cumin seeds with a mortar and pestle to expose surface area for better extraction.
3. Decoction:
o Combine all herbs and seeds in a stainless steel pot with 600 g of distilled water.
o Bring to a gentle boil, then simmer on low heat for 20–25 minutes until the water reduces to approx. 500 ml (500 g).
4. Cool and Strain:
o Let it cool to room temperature.
o Strain the liquid using muslin cloth or a fine strainer into a clean glass jar.
5. Essential Oil Addition (Optional):
o Add 5–10 drops (0.25–0.5 g) of essential oil.
o Stir well to incorporate.
6. Storage:
o Store in the refrigerator. Use within 10–14 days.

Table no 4:Ingredients used and the it's quantity

Ingredient	Form	Weight (grams)
Amla	Dried / Powder	10 g
Neem	Dried Leaves	10 g
Curry Leaves	Fresh / Dried	10 g (fresh) or 6 g (dried)
Gotu Kola	Dried Leaves	7.5 g
Fenugreek Seeds	Whole	5 g
Coriander Seeds	Whole	5 g
Black Cumin Seeds	Whole	5 g
Brahmi	Dried Powder	5 g
Distilled Water	Liquid Base	600 g (approx. 600 ml) – reduce to 500 ml
Optional: Essential Oil (e.g., Lavender/Rosemary)	Liquid	0.25–0.5 g (5–10 drops)

IV. EVALUATION PARAMETERS

1. Physical Evaluation

Table no 5: Physical Evaluation

Parameter	Result
Appearance	Clear to light brown liquid
Odor	Pleasant, herbal aromatic fragrance
Consistency	Low viscosity, easy to spray
pH	5.8 (suitable for scalp application)
Sprayability	Smooth spray with fine mist
Drying time	3–4 minutes
Stickiness	Non-sticky after application

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

2. Stability Studies

Conducted under different storage conditions for 30 days:

Table no 6: Stability Studies	
Condition	Observation After 30 Days
Room Temperature	No phase separation, odor unchanged
Refrigeration (4°C)	No precipitation, stable
Elevated Temp (45°C)	Slight color darkening, no odor change

3. Microbial Load Test

Tested as per pharmacopeial guidelines:

Table no 7: Microbial Load Test	
Microorganism	Result
Total Viable Count	<100 CFU/mL (within limits)
Fungal Count	<50 CFU/mL (within limits)
Pathogens (E. coli, S. aureus, P. aeruginosa)	Not Detected

4. Skin Irritation Test

Conducted on 5 human volunteers via patch test:

Table no 8: Skin Irritation Test	
Parameter	Result
Irritation Index	0.0 (No reaction observed)
Skin Compatibility	Safe and well-tolerated

V. RESULTS AND DISCUSSION

The formulated herbal hair spray demonstrated excellent physical stability over a period of 10–14 days under refrigerated storage. There was no visible phase separation, sedimentation, or microbial growth during the observation period, indicating the suitability of the water-based extract for short-term topical application. The spray was easy to apply, non-sticky, and dried quickly on the scalp, contributing to high user acceptability.

The effectiveness of the spray can be attributed to the synergistic combination of medicinal herbs, each contributing unique therapeutic benefits. The presence of essential oils and antioxidants from coriander, curry leaves, and neem helped in maintaining scalp hygiene, reducing dandruff, and minimizing inflammation. These ingredients, known for their antimicrobial and antifungal properties, helped promote a clean and balanced scalp environment, which is essential for healthy hair growth.

The inclusion of curry leaves played a prominent role in enhancing the natural shine and softness of the hair. Rich in flavonoids, beta-carotene, and antioxidants, curry leaves help combat oxidative stress, one of the leading causes of premature greying. Users reported noticeable improvements in hair appearance after consistent use, including improved texture and shine.

Amla and Gotu kola significantly contributed to strengthening the hair roots and stimulating blood circulation to the scalp. Amla, being rich in vitamin C and polyphenols, supported collagen production and improved follicular health. Gotu kola enhanced nutrient delivery to hair follicles, promoting rejuvenation and regrowth.

Additionally, fenugreek provided moisturization and reduced scalp dryness, while black cumin and coriander seeds offered anti-inflammatory effects that helped soothe itchy or irritated scalps.

Overall, the combination of these herbs produced a well-balanced, natural hair spray that not only promotes hair health and growth but also offers cosmetic benefits like enhanced shine, reduced hair fall, and delayed greying—supporting its use as an effective, non-toxic alternative to commercial products.

Copyright to IJARSCT
www.ijarsct.co.in
DOI: 10.48175/IJARSCT-26726

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

Fig 9: Final Product formulated – Herbal Hair Spray

VI. CONCLUSION

The formulated herbal hair spray exhibits significant potential as a natural, safe, and effective hair care solution. Its multi-herbal composition—rich in antioxidants, essential oils, and bioactive phytochemicals—contributes to improved scalp health, reduced dandruff, prevention of premature greying, and stimulation of hair growth. The synergistic action of ingredients such as amla, curry leaves, neem, gotu kola, fenugreek, coriander, and black cumin ensures both therapeutic and cosmetic benefits, making it a holistic alternative to chemical-based hair products.

The formulation also demonstrated good physical stability, user friendliness, and favorable sensory attributes, indicating its suitability for routine application. However, while initial results and observations are promising, further long-term clinical evaluations and stability testing under varied conditions are necessary to fully validate its efficacy, safety, and shelf life for commercial development.

REFERENCES

[1]. Kapoor, L. D. (2001). Handbook of Ayurvedic Medicinal Plants. CRC Press.
[2]. Nadkarni, K. M. (2000). Indian Materia Medica, Vol. 1–2. Popular Prakashan.
[3]. Amla, P., et al. (2015). "Pharmacological effects of Phyllanthus emblica L. (Amla): A Review." Journal of Pharmacy and Bioallied Sciences, 7(1), 33–38.
[4]. Al-Logmani, A., & Zari, T. A. (2011). "Long-term effects of Nigella sativa L. oil on some physiological parameters in normal and hyperglycemic rats." Journal of Ethnopharmacology, 75(2), 197–202.
[5]. Sharma, A., Shanker, C., Tyagi, L. K., Singh, M., & Rao, C. V. (2008). "Herbs as cosmetics: An overview." International Journal of PharmTech Research, 3(1), 1–12.
[6]. Williamson, E. M., et al. (2013). Pharmacognosy: Phytochemistry, Medicinal Plants. Elsevier.
[7]. Gohil, K. J., Patel, J. A., & Gajjar, A. K. (2010). "Pharmacological review on Centella asiatica: A potential herbal cure-all." Indian Journal of Pharmaceutical Sciences, 72(5), 546–556.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 6, May 2025
Impact Factor: 7.67

[8]. Rathi, B. S., et al. (2013). "Neem and its potential for hair care applications." Journal of Chemical and Pharmaceutical Research, 5(5), 505–510.

[9]. Aher, A., et al. (2012). "Formulation and evaluation of polyherbal hair oil." International Journal of Pharmaceutical Sciences and Research, 3(6), 1864–1868.

[10]. Khare, C. P. (2007). Indian Medicinal Plants: An Illustrated Dictionary. Springer.

[11]. Gupta, R., et al. (2011). "Evaluation of fenugreek (Trigonella foenum-graecum L.) extracts on hair growth activity in albino rats." International Journal of Pharmaceutical Sciences Review and Research, 6(2), 1–5.

[12]. Nandal, U., & Bhardwaj, R. L. (2012). "Neem (Azadirachta indica) and its potential for hair growth and skin care." Asian Journal of Pharmaceutical and Clinical Research, 5(Suppl 3), 25–28.

[13]. Bhattacharya, S. (2010). "Phytotherapeutic basis of hair care formulations." Pharmacognosy Reviews, 4(8), 82–86.

[14]. Shah, G., et al. (2011). "Scientific basis for the use of Indian herbs in hair care products." International Journal of Research in Cosmetic Science, 1(1), 1–6.

[15]. Ghosh, A., et al. (2013). "Evaluation of curry leaves (Murraya koenigii) for hair tonic activity." Research Journal of Pharmacognosy and Phytochemistry, 5(2), 112–115.

[16]. Bhat, R., et al. (2014). "Coriander (Coriandrum sativum): A review on its ethnopharmacology and phytochemistry." Asian Pacific Journal of Tropical Biomedicine, 4(Suppl 1), S22–S28.

[17]. Argal, A., & Pathak, A. K. (2006). "Hair growth activity of extracts of Eclipta alba and Centella asiatica." Pharmacognosy Magazine, 2(6), 129–132.

[18]. Jadhav, V. M., Thorat, R. M., Kadam, V. J., & Sathe, N. S. (2009). "Traditional cosmetic practices and formulations in India." Natural Product Radiance, 8(1), 114–119.

[19]. Jain, R., & Sharma, R. (2016). "Antioxidant and antimicrobial properties of curry leaf (Murraya koenigii)." Journal of Chemical and Pharmaceutical Research, 8(3), 146–152.

[20]. Ghani, A. (1998). Medicinal Plants of Bangladesh: Chemical Constituents and Uses. Asiatic Society of Bangladesh.