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Evaluation of Formulated Polyherbal Oil for Hair

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Abstract: ***Due to environmental pollution, psychology stress, hormonal imbalance, unhealthy nutrition and the overuse of synthetic cosmetics, hair loss, dandruff, premature greying, hair thinning, and scalp disorders have become more common in recent years around the world. Despite the availability of a number of synthetic drugs for treatment of hair related disorders, it is to be noted that very few of these drugs are found to be free from adverse effects and there is reduction in patient compliance due to their long-term use. As such, herbal formulations are gaining traction as more natural and sustainable options for healthy hair. The present study aims to formulate standardise and evaluate a polyherbal hair growth oil using the medicinal plants which are known to possess hair growth enhancing property. The formulation was made with Amla (Phyllanthus emblica), Hibiscus (Hibiscus rosa-sinensis), Fenugreek (Trigonella foenum-graecum), Curry Leaves (Murraya koenigii), Neem (Azadirachta indica), and in natural oil base (coconut oil). Herbal ingredients were chosen as a result of their proven antioxidant, antimicrobial, anti-inflammatory, anti-dandruff and follicle-stimulating properties. The prepared formulation was assessed for organoleptic properties, physicochemical properties, stability, uniformity, viscosity, specific gravity, acid value, saponification value, skin irritation potential and cosmetics acceptability. The formulated oil had desirable physicochemical properties, excellent stability under accelerated storage conditions and satisfactory safety profiles. The combined effects of bioactive phytoconstituents like flavonoids, polyphenols, tannins, alkaloids, amino acids, vitamins and essential fatty acids can play a major role in the nourishment, stimulation of dormant hair follicles, prevention of hair fall, strengthening of the hair shaft and health of the scalp. The findings of the current study indicate that the formulated polyherbal hair growth oil is a potential natural alternative to the synthetic hair care formulations and can be used as an effective formulation in promoting healthy hair growth and protecting the scalp from harmful effects of the hair care products.***

Keywords: Polyherbal Hair Oil, Hair Growth Promotion, Herbal Cosmetics, Hair Follicle Stimulation, Scalp Health, Natural Hair Care, Herbal Formulation.

I. INTRODUCTION

Hair is a specialised keratinised appendage of the skin and is a crucial part of our appearance, social self-confidence and psychological health. Apart from its cosmetic value, hair has a number of physiological roles such as protection from the ultraviolet radiation, thermal insulation and perception. The desirable qualities of healthy hair include density, strength, luster, and elasticity.[1] The desirable characteristics of healthy hair are density, strength, luster and resistance to breakage. But, the normal physiology of the hair can be compromised by a number of intrinsic and extrinsic factors, leading to various hair problems like alopecia, dandruff, premature grey hair, thinning hair, split ends and inflammation of the scalp.[2]

The hair follicle is a dynamic mini-organ that undergoes continuous cyclic changes that can be divided into three major phases: anagen (growth phase), catagen (regression phase), and telogen (resting phase). They may get disturbed from their normal cycle, resulting in excess hair fall and less hair density. Epidemiological studies have shown that over the past few decades, a significant rise in hair-related disorders has occurred, mainly due to environmental pollution, nutritional deficiencies, chronic stress, endocrine disorders, genetic predisposition and frequent use of chemical products used for hair.[3]

Conventional pharmacological approaches for the management of hair loss mainly include topical minoxidil and oral finasteride. These agents have been proven to be clinically effective, but they have also been linked to an increase in side effects including scalp irritation, erythema, pruritus, sexual dysfunction, and decreased long-term use.[4] Thus, a search for safer and natural alternatives has been increasingly picked up by the research, clinical, and consumer communities.The herbal cosmetics have been found to be an important niche in cosmetics industry due to their safety, biocompatibility, cost effectiveness, therapeutic activity etc.Herbal cosmetics are an important area in the cosmetic industry because they are considered to be safe, biocompatible, cost-effective and therapeutic. Medicated hair oils have a special place among the herbal cosmetic preparations as they offer both cosmetic and pharmacological benefits. The natural healing systems of medicine, especially Ayurveda, have always recommended using herbal oils on a regular basis to obtain beautiful hair and avoid any problems with the scalp.

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[5] The Ayurvedic texts mention several botanical ingredients with rejuvenating, nourishing and hair stimulating properties.These traditional claims have been substantiated by recent scientific studies. Amla (*Phyllanthus emblica*) is known for its rich vitamin C content and strong antioxidant properties that safeguard against oxidative damage in your hair follicles. The flavonoids and amino acids found in Hibiscus (*Hibiscus rosa-sinensis*) promote the regeneration of the follicles and extend the anagen phase of the hair cycle. Proteins, nicotinic acid and steroidal saponins found in fenugreek fortify the roots of hair and prevent hair fall. The antimicrobial and anti-inflammatory properties of neem (*Azadirachta indica*) enhance dandruff management and promote scalp health. Curry leaves (*Murraya koenigii*) are good source of antioxidants and nutrients that prevent premature greying and strengthen hair.[6] The moisturizing, soothing, and wound healing action of aloe vera adds to the comfort and moisture of the scalp.The idea of polyherbal formulations is based on synergism, that is, the combination of several medicinal plants for better therapeutic action than isolated plants. These types of formulations deliver a wide range of phytoconstituents that can target multiple mechanisms related to the regulation of hair growth, nourishment of follicles, anti-oxidation effects and protection of the scalp.[7]

The present study aimed at formulating a polyherbal hair growth oil using selected medicinal plants that are scientifically proven to have ethnopharmacological relevance and hair growth properties. The formulation was then subjected to detailed physicochemical and stability analysis for suitability as a safe and effective herbal cosmetic formulation.

II. INGREDIENTS AND METHODS

A. *Study Design*

In the present study, the formulation of poly herbal hair growth oil of medicinal plants which traditionally known for the hair and scalp health was developed. The study involved five main stages which included selection of herbal ingredients, processing of crude drugs, formulation development, physicochemical evaluation and stability assessment.[8]

B. *Collection and Authentication of Plant Ingredients*

Fresh Amla fruits, Hibiscus flowers, Curry leaves, Neem leaves and Aloe vera leaves were procured from a well authenticated herbal source. The fenugreek seeds were purchased from a certified herbal supplier. The collected plant Ingredients were washed with distilled water to completely remove dust, soil particles and foreign bodies present on the plants. The plants were botanically authenticated by employing the conventional pharmacognostic methods prior to its utilization in formulation development.[9]

C. *Preparation of Herbal Raw Ingredients*

Shade drying was done for the collected plant material under controlled environmental conditions to preserve the heat sensitive phytoconstituents. Dried Ingredients were ground on a mechanical grinder, passed through sieve and pulverized separately in order to get uniformly small particles for the extraction and oil infusion process.[10]

D. *Composition of Polyherbal Hair Growth Oil*

The formulation was composed by choosing medicinal plants that have scientifically proven to possess hair-growth promoting, antioxidant, anti-inflammatory, antimicrobial and conditioning properties of the scalp. Coconut oil was chosen as the main carrier oil because of its effective penetration into the hair shaft and its capacity to minimize hair protein loss. Almond oil was added for its Vitamin E and essential fatty acid content and castor oil was added for its purported ability to thicken hair.[11]

Table 1. Composition of Polyherbal Hair Growth Oil

Sl. No.	Ingredient	Scientific Name	Part Used	Functional Role	Reference
1	Amla	*Phyllanthus emblica*	Fruit	Hair growth promoter	[12]
2	Hibiscus	*Hibiscus rosa-sinensis*	Flower	Follicular stimulation	[13]
3	Fenugreek	*Trigonella foenum-graecum*	Seed	Hair strengthening	[14]

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4	Curry Leaves	*Murraya koenigii*	Leaf	Antioxidant	[15]
5	Coconut Oil	*Cocos nucifera*	Oil	Base oil	[16]
6	Onion	*Allium cepa*	Root	Hair growth promoter	[17]
6	Neem	*Azadirachta indica*	leaf	Antimicrobial	[18]

Figure 1. Curry leves (*Murraya koenigii*)



Figure 2. Onion (*Allium cepa*)



Figure 3. Amla (*Phyllanthus emblica*)



Figure 4. Fenugreek (*Trigonella foenum-graecum*)



Figure 5. Hibiscus (*Hibiscus rosa-sinensis*)



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Figure 6. Coconut Oil (*Cocos nucifera*)



Figure 7. Neem *Azadirachta indica*



E. Phytochemical Profile of Selected Herbal Ingredients

The selected medicinal plants contain numerous bioactive compounds that collectively contribute to hair growth promotion and scalp protection.[17]

Table 2. Major Phytoconstituents and Their Biological Activities

Plant	Major Constituents	Biological Activity	Reference
Amla	Vitamin C, Tannins, Gallic Acid	Antioxidant, Hair Growth	[14]
Hibiscus	Flavonoids, Anthocyanins	Follicle Activation	[15]
Fenugreek	Saponins, Proteins, Trigonelline	Hair Strengthening	[16]
Curry Leaves	Carbazole Alkaloids	Anti-greying Activity	[17]
Neem	Azadirachtin, Nimbin	Antimicrobial Activity	[18]
Onion	Flavonoids,saponins	Antioxidant, Hair Growth	[19]

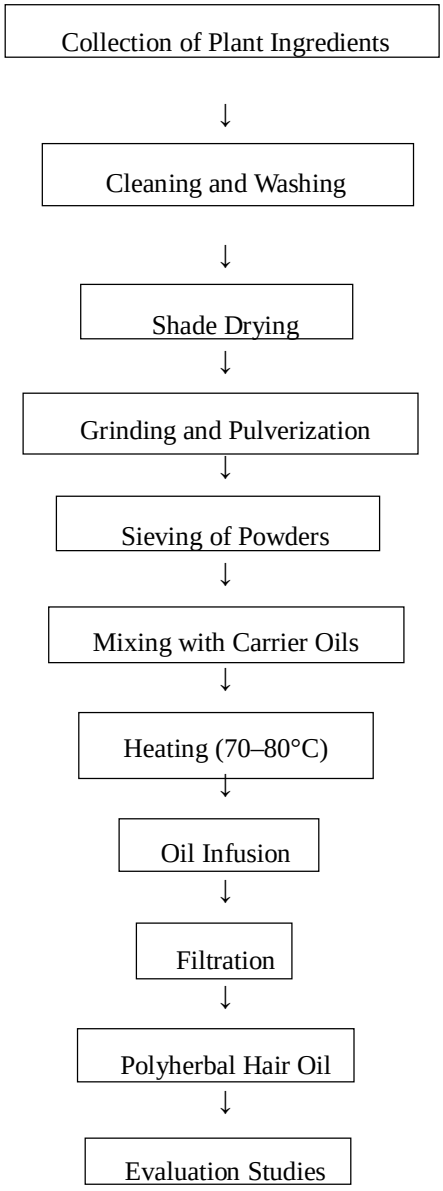
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F. Method of Preparation

A polyherbal hair growth oil was prepared by a traditional oil infusion process with a little modification. All herbal powders were first accurately weighed in line with the formulation design. These oils (coconut) were placed in a stainless-steel extraction vessel and gently heated. The powdered herbal ingredients were then added into the oil mixture and stirred for a prolonged time.

The mixture was heated at 70-80°C for about 60 minutes so that bioactive compounds would be extracted into the oil phase. To prevent sedimentation and uniform extraction, a constant agitation was maintained during heating. The mixture was filtered after the extraction process was completed, successively through muslin cloth and Whatman No. 1 filter paper, and then cooled to room temperature.Filtered oil was collected in amber colored glass containers and kept at room temperature for further evaluation.[20,21]

Flowchart of Formulation Process



G. Phytochemical Studies

A portion weighing about 5 grams of each of the dried and powdered sample of the selected medicinal plant like *Phyllanthus emblica* (Amla), *Hibiscus rosa-sinensis* (Hibiscus), *Trigonella foenum-graecum* (Fenugreek), *Murraya koenigii* (Curry Leaves), *Azadirachta indica* (Neem) was extracted separately by dry distillation of 70% ethanol for 48 hours with intermittent shaking.

Post-extraction, the solutions are filtered and the solvent is concentrated by evaporation under reduced pressure. Preliminary phytochemical screening for the detection of bioactive constituents such as alkaloids, flavonoids, tannins, glycosides, saponins, proteins, amino acids, terpenoids, polyphenols and carbohydrates of the concentrated extracts.[22]

Table 3: Phytochemical Screening of Selected Medicinal Plants

Bioactive Constituents	Amla	Hibiscus	Fenugreek	Curry Leaves	Neem	Onion
Alkaloids	+	+	+	+	+	±
Carbohydrates	+	+	+	+	+	+
Tannins	+	+	-	-	+	-
Flavonoids	+	+	+	+	+	+
Terpenoids	+	+	+	+	+	+
Amino acids	+	+	+	+	-	+
Proteins	-	+	+	-	-	-
Glycosides	+	+	+	+	+	+
Polyphenols	+	+	+	+	+	+
Saponins	-	+	+	-	+	+

(+ = Present, – = Absent, ± = Trace amount)

The investigation of phytochemicals revealed the presence of several therapeutically important secondary metabolites responsible for antioxidant, antibacterial, anti-inflammatory and hair growth promoting activities. The huge number of flavonoids, polyphenols, terpenoids and glycosides indicates the potential efficacy of the formulation in maintaining scalp health and stimulating hair follicle activity.[23]

H. Preparation of Polyherbal Hair Growth Oil

The powdered doses were prepared from purified dry herbal Ingredients of Amla, Hibiscus, Fenugreek, Curry Leaves and Neem passing through sieve was collected from fresh mature leaves and homogenized. Coconut oil, were used as carrier oils. The oil base was mixed with herbal powders and heated to 70–80°C under continuous stirring for about one hour to help the bioactive components dissolve in the oil phase. The preparation was then cooled and filtered successively through muslin cloth. The polyherbal oil obtained was preserved in amber colored airtight glass container for further studies.[24]

Table 4: Formulation of Polyherbal Hair Growth Oil

Sl. No.	Ingredients	Quantity (Per 100 mL)
1	Amla powder (*Phyllanthus emblica*)	5 g
2	Hibiscus powder (*Hibiscus rosa-sinensis*)	5 g
3	Fenugreek powder (*Trigonella foenum-graecum*)	5 g
4	Curry Leaf powder (*Murraya koenigii*)	5 g
5	Neem Leaf powder (*Azadirachta indica*)	5 g
6	Coconut oil	50 mL

I. Standardization of Polyherbal Hair Growth Oil

Organoleptic Evaluation

Table 5: Organoleptic Evaluation of Polyherbal Hair Oil

Parameter	Observation
Colour	Dark Greenish Brown

Odour	Pleasant Herbal Aroma
Appearance	Clear and Homogeneous
Texture	Smooth and Non-gritty
Consistency	Moderately Viscous

J. Physicochemical Evaluation of Polyherbal Hair Oil

1) Specific Gravity

Specific gravity was determined using a specific gravity bottle and calculated as:

$$\text{Specific Gravity} = \frac{\text{Weight of Oil}}{\text{Weight of Equal Volume of Water}}$$

2) Viscosity

Viscosity was measured using a Brookfield Viscometer at room temperature.

3) pH

The pH of the oil was determined after preparing a 10% oil emulsion in distilled water.

4) Acid Value

Acid value was determined to evaluate the amount of free fatty acids present in the formulation.

$$\text{Acid Value} = \frac{56.1 \times N \times V}{W}$$

5) Saponification Value

Saponification value was determined to assess the average molecular weight of fatty acids present in the oil.

$$\text{Saponification Value} = \frac{(B - S) \times N \times 56.1}{W}$$

6) Refractive Index

The refractive index was measured using an Abbe refractometer.

III. RESULTS AND DISCUSSION

A. Physicochemical Evaluation

Table 6: Physicochemical Characteristics of Polyherbal Hair Growth Oil

Sl. No.	Test Parameter	Result
1	Colour	Dark Greenish Brown
2	Odour	Pleasant Herbal
3	Specific Gravity	0.9
4	pH	5.1
5	Viscosity	32 cP
6	Refractive Index	1.468
7	Acid Value	1.10 mg KOH/g
8	Saponification Value	188 mg KOH/g
9	Skin Irritation Test	No Irritation
10	Phase Separation	Absent
11	Homogeneity	Good

The developed herbal hair oil exhibited good physical and chemical characteristics. The specific gravity found was within the range of herbal cosmetic oils, which indicates proper formulation consistency. The pH of the formulation was comparable to that of physiological scalp pH and thus considered suitable for topical application without irritation. The formulation had an appropriate viscosity that made it easy to apply and remain on the scalp. Analysis of the Acid value revealed low free fatty acids indicating rancidity is not there and storage stability is good. The observed saponification value was due to the presence of fatty acid esters from carrier oils. The formulation maintained its physical stability at room temperature.

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As a whole, the evaluation results indicated that the developed polyherbal hair oil has desirable cosmetic and pharmaceutical properties and can be considered useful in regular hair care applications.

IV. CONCLUSION

The current study successfully produced and assessed a polyherbal hair growth oil composed of various herbal ingredients such as *Phyllanthus emblica*, *Hibiscus rosa-sinensis*, *Trigonella foenum-graecum*, *Murraya koenigii*, *Azadirachta indica* Miller along with coconut oil. The medicinal plants chosen appeared to have certain phytoconstituents known for aiding hair growth and effective functioning of the scalp. Noteworthy among these were flavonoids, polyphenols, glycosides, alkaooids, terpenoids and saponins. The oil that was made had good sensible properties and acceptable physicochemical properties. It has good homogeneity and good stability during storage. No evidence was observed for any skin-irritating effect, phase separation, or formulation incompatibility. The synergistic effect of the herbal components may prevent hair fall, strengthen hair roots, improve scalp health and promote hair growth. As a result, the polyherbal hair growth oil may provide a safe, stable and effective alternative to synthetic hair care products. It is recommended to conduct more clinical studies and stability studies to check its therapeutic and commercial value.

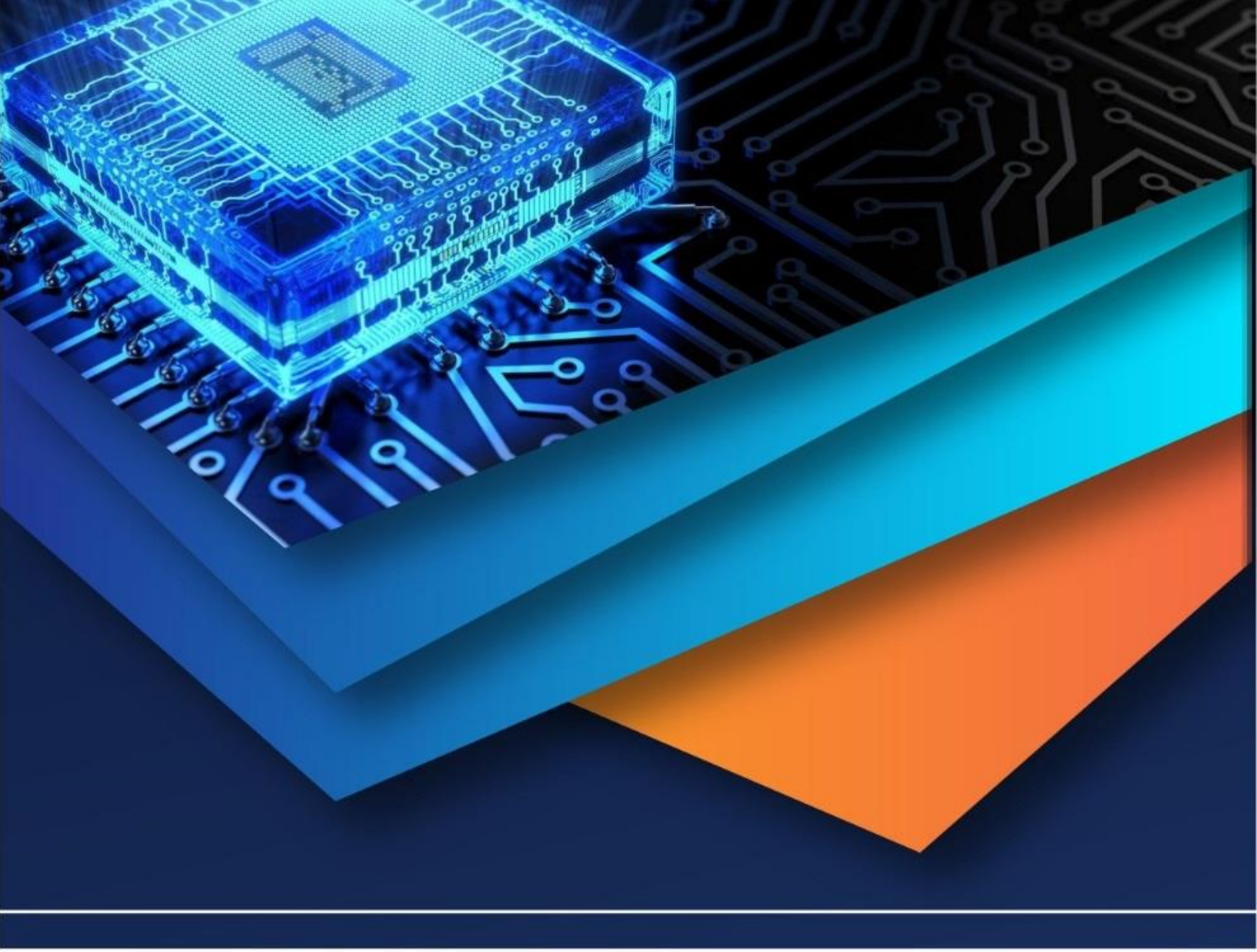
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Conflict of Interest**:** No

REFERENCES

[1] Ahmed A, Sharma D, Ungar B. Impact of nutraceutical supplements on hair growth in non-scarring alopecia: a systematic review and meta-analysis. Arch Dermatol Res. 2025;317(1):801. DOI: https://doi.org/10.1007/s00403-025-04306-8
[2] Zhou L, Zhu Y, Chen X. Effects of dietary supplements on androgenetic alopecia: a systematic review and network meta-analysis. Front Nutr. 2025;12:1719711. DOI: https://doi.org/10.3389/fnut.2025.1719711
[3] Drake L, Reyes-Hadsall S, Martinez J, Heinrich C, Huang K, Mostaghimi A. Evaluation of the safety and effectiveness of nutritional supplements for treating hair loss: a systematic review. JAMA Dermatol. 2023;159(1):79-87. DOI: https://doi.org/10.1001/jamadermatol.2022.4867
[4] Catalano A, et al. Aloe vera—An extensive review focused on recent studies. Foods. 2024;13(13):2155. DOI: https://doi.org/10.3390/foods13132155
[5] Youssef A, et al. A comprehensive review of natural alternatives for hair loss management. J Med Food. 2022;25(9):889-905. DOI: https://doi.org/10.1089/jmf.2021.0156
[6] Bhatia N, et al. A randomized, double-blind, placebo-controlled study to evaluate a nutraceutical for improving hair growth and quality in men with thinning hair. J Cosmet Dermatol. 2025. DOI: https://doi.org/10.1111/jocd.16778
[7] Bernárdez C, et al. Efficacy and safety of a drinkable nutraceutical in women with hair loss: a 6-month study. Dermatol Ther. 2025.
[8] Alanazi R, et al. Evaluating the effectiveness of commercial oral supplements for hair growth: a systematic review and meta-analysis. Skin Health Dis. 2026.
[9] Gupta AK, et al. Nutraceuticals versus conventional therapies for male androgenetic alopecia: a systematic review and network meta-analysis. Int J Mol Sci. 2025;26(16):7920. DOI: https://doi.org/10.3390/ijms26167920
[10] Draelos Z, et al. A 6-month prospective multi-arm study evaluating nutraceuticals for hair thinning. 2025.
[11] Allam AT, et al. Pathophysiology, conventional treatments, and evidence-based complementary approaches for androgen-sensitive alopecia. Naunyn Schmiedebergs Arch Pharmacol. 2025. DOI: https://doi.org/10.1007/s00210-025-04286-6
[12] Micronutrients and androgenetic alopecia: a systematic review. Mol Nutr Food Res. 2024. DOI: https://doi.org/10.1002/mnfr.202400652
[13] Verma S, Gupta A, Sharma R. Herbal formulations for hair growth promotion: a comprehensive review of medicinal plants and their phytoconstituents. J Cosmet Dermatol. 2022;21(8):3284–3296.
[14] Kaur R, Sharma P, Singh J. Phytochemical and pharmacological potential of Phyllanthus emblica in hair care applications: a review. J Ethnopharmacol. 2023;310:116354. DOI: https://doi.org/10.1016/j.jep.2023.116354
[15] Singh P, Kumar V, Bhatia S. Therapeutic potential of Hibiscus rosa-sinensis in hair growth and scalp disorders. Phytomedicine Plus. 2022;2(4):100321. DOI: https://doi.org/10.1016/j.phyplu.2022.100321
[16] Almatroodi SA, Almatroudi A, Rahmani AH. Pharmacological importance of Trigonella foenum-graecum (Fenugreek): an updated review. Saudi J Biol Sci. 2021;28(3):2061–2071. DOI: https://doi.org/10.1016/j.sjbs.2020.12.013
[17] Patel DK, Kumar R, Laloo D. Murraya koenigii (Curry Leaf): phytochemistry, pharmacology and medicinal applications. Plants. 2022;11(11):1436. DOI: https://doi.org/10.3390/plants11111436
[18] Alzohairy MA. Recent advances in the therapeutic applications of Azadirachta indica (Neem): a comprehensive review. Molecules. 2023;28(17):6312. DOI: https://doi.org/10.3390/molecules28176312
[19] Das RK, Kotal A, Rej A, Chakraborty S, Bhattacharya S, Pal R, Saha S, Bhattacharjee A. A Comparative Study of Antidiabetic Activity of Azadirachta indica, Aloe vera and Allium cepa. International Journal for Research in Applied Science & Engineering Technology. 2022; 10(IV): 1119-1130.
[20] Indian Pharmacopoeia Commission. Indian Pharmacopoeia. 9th ed. Ghaziabad: IPC; 2022.
[21] Evans WC. Trease and Evans Pharmacognosy. 17th ed. London: Elsevier; 2022.
[22] Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 59th ed. Pune: Nirali Prakashan; 2023.
[23] Harborne JB. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. 5th ed. London: Springer Nature; 2022.
[24] Shah RB, Tawakkul MA, Khan MA. Comparative evaluation of flow properties of pharmaceutical powders and granules. AAPS PharmSciTech. 2021;22(4):142.

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