IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Formulation And Evaluation Of Herbal Hair Serum

[1]Shakti Rathod, [2]Vini Prajapati, [3]Rajvi Mahida

[1]Student, [2]Student, [3]Assistant Professor

[1]ROFEL SHRI G.M. BILAKHIA COLLEGE OF PHARMACY, Vapi, Gujarat, India.

Abstract: This study explores the formulation and evaluation of an herbal hair serum incorporating fenugreek seed and curry leaves extracts, combined with jojoba oil, coconut oil, and vitamin E, to promote hair health. Fenugreek seeds, rich in proteins and nicotinic acid, strengthen hair and prevent hair loss, while curry leaves, high in antioxidants, promote hair growth and prevent premature graying. The serum leverages the anti-inflammatory, antimicrobial, and antioxidant properties of phenolic compounds found in plant extracts. The aim was to prepare and evaluate a preliminary batch of herbal hair serum containing (*Trigonella Foenum Graecum)* and (*Murraya Koenigii*) to optimize the formulation. Rationale includes the reduction of dandruff and scalp irritation, prevention of hair thinning and premature graying, deep moisturization, and promotion of healthy hair growth through improved scalp circulation.

Keywords **–** Fenugreek Seeds, Curry Leaves, Natural Ingredients, Herbal Hair Serum.

I. INTRODUCTION

Hair and scalp issues such as oxidative stress, premature graying, inflammation, dryness, and poor blood circulation are common concerns. Herbal remedies offer a safer and more natural alternative to chemical-based products. This study focuses on formulating a herbal hair serum (figure 1) using fenugreek seeds (*Trigonella foenum-graecum*) and curry leaves (*Murraya koenigii*), both known for their traditional use in promoting hair health. The aim was to develop a formulation that could nourish the scalp, reduce damage, and strengthen hair naturally. Phytochemical analysis and evaluation tests were conducted to assess the effectiveness of this combination in addressing multiple hair care needs.

Figure 1- Hair Serum

II. MATERIALS AND METHODS

1. FENUGREEK SEEDS

Lecithin present in fenugreek seeds (*Trigonella Foenum Graecum)* (Figure 2) is a natural emollient that helps moisturize and strengthen hair, preventing dryness and breakage. Saponin (furostanol) and flavonoids in fenugreek seeds possess anti-inflammatory and anti-fungal properties, effective in treating dandruff and scalp irritation. Fenugreek seeds also contain nicotinic acid (vitamin B3), which helps improve blood circulation to the scalp.

These constituents make the serum efficient for promoting healthy hair and scalp. Fenugreek seeds are also a natural remedy for thinning hair and support scalp health. They treat dandruff and scalp irritation with their anti-inflammatory, anti-fungal, moisturizing, skin-soothing, and wound-healing properties. Protein, essential fats, zinc, and iron in the seeds support proper hair growth.

Figure 2 - Fenugreek Seeds

2. CURRY LEAVES

Curry leaves (Murraya Koenigii) (Figure 3), from the Rutaceae family, are rich in compounds like carbazole alkaloids, beta-carotene, and other antioxidants that help protect hair follicles from damage. They promote healthy cell growth, sebum production, and prevent dryness and dandruff. Nutrients such as vitamins A, B, C, proteins, amino acids, calcium, iron, and phosphorus nourish the scalp, reduce hair fall, add shine, and prevent premature greying. The oil in curry leaves helps repair damage, remove dead skin, and improve scalp health. Their antimicrobial properties also help treat dandruff and scalp infections.

Figure 3 - Curry leaves

3. JOJOBA OIL

Jojoba oil (*Simmondsia chinensis*) closely resembles the scalp's natural sebum, helping to moisturize and balance oil levels. It nourishes hair, adds shine, and reduces breakage. Rich in vitamins and minerals, it supports healthy growth. Its anti-inflammatory and antimicrobial properties soothe the scalp and help reduce dandruff.

4. LAVENDER OIL

Lavender oil (*Lavandula angustifolia*) is known for its calming and antimicrobial properties. It improves blood circulation to the scalp, promotes hair growth, and helps reduce hair thinning. Its soothing effects relieve scalp irritation, while its antifungal action helps control dandruff and maintain a healthy scalp environment.

5. VITAMIN-E CAPSULE

Vitamin E (Tocopherol) is a powerful antioxidant that helps protect hair follicles from oxidative stress. It improves blood circulation to the scalp, promotes healthy hair growth, and adds shine. It also moisturizes the scalp, reduces dryness, and helps repair damaged hair.

6. LEMON OIL

Lemon (*Citrus limon*) helps maintain the natural pH balance of the scalp due to its mildly acidic nature. It closes hair cuticles, adds shine, and reduces frizz. By restoring pH, it also helps control excess oil, reduce dandruff, and promote a healthy scalp environment

7. COCONUT OIL

Coconut oil (*Cocos nucifera*) is used to extract nutrients from curry leaves (*Murraya koenigii*), helping retain their active compounds. It enhances absorption, moisturizes the scalp, reduces dandruff, and strengthens hair by preventing protein loss.

III. PROCEDURE

3.1. Preparation of fenugreek seeds extract.

- Weighed approximately 150gm of fenugreek seed and ground into coarse powder.
- Then it was filled with PET ether until the content in the container soaked completely.
- Left for 3 days with occasional stirring at regular interval.
- After the time period the solvent is removed by filtering.
- Filtrate was evaporated by temperature controlled water bath at 30-C
- Extract of fenugreek seed is obtained.

3.2. Preparation of curry leaves extract

- Take 30-40 leaves of curry leaves.
- Wash them and let them dried
- Then take the leaves directly add into coconut oil and heat at low flame.
- Until the leaves become crunchy and brown and oil become greenness. (5-10 min) .

IV. METHOD OF PREPARATION OF HERBAL HAIR SERUM

- The fenugreek seed extract was added to the curry leaf extract prepared in coconut oil.
- Jojoba oil was then incorporated into the mixture,
- Followed by the dropwise addition of lavender oil to mask the odour.
- Vitamin E capsule was added to enhance the stability and shelf life of the formulation.
- Finally, lemon oil was incorporated gradually until the desired pH was achieved.

V. MATERIALS USED FOR FORMULATION

Table 1: Materials used for formulation

Sr.no	Material	Category
1.	Fenugreek seeds extract	Emollient and scalp circulation booster
2.	Curry leaves extract	Strengthening
3.	Jojoba oil	Conditioning carrier oil
4.	Lavender oil	Fragrance and calming agent
5.	Lemon oil	pH adjuster
6.	Coconut oil	Hair strengthener
7.	Vitamin-E capsule	Antioxidant and stabilizer

5.1. DIFFERENT BATCHES OF HERBAL HAIR SERUM

Table 2: Different batches of herbal hair serum

SR. NO.	INGREDIENTS	H1	H2	H3	H4
1.	Fenugreek seeds extract	3ml	5ml	**2ml**	1ml
2.	Curry leaves extract	6ml	10ml	**8ml**	4ml
3.	Jojoba oil	10ml	10ml	**10ml**	10ml
4.	Lavender oil	q.s.	q.s.	**q.s.**	q.s.
5.	Lemon oil	q.s.	q.s.	**q.s.**	q.s.
6.	Vitamin-E capsule	3 capsules	3 capsules	**3 capsules**	3 capsules

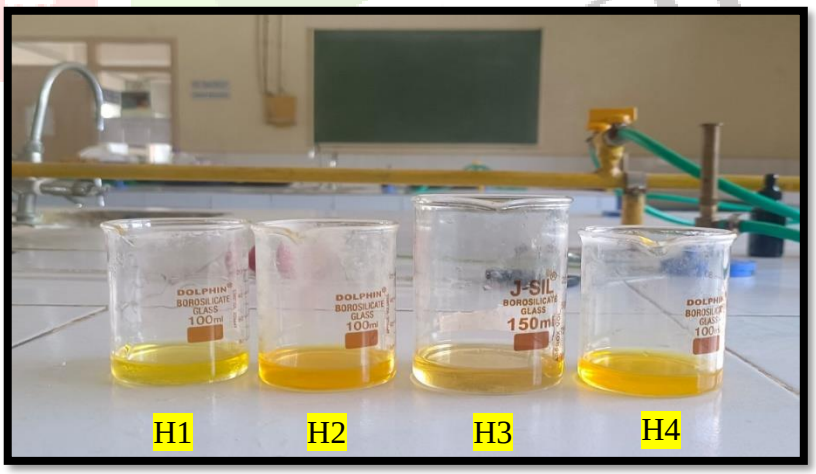

Figure 4: Different batches of herbal hair serum

Problems faced in H1: The H1 batch started degrading within 24 hours as curry leaves extract was prepared using water.
Problems faced in H2: In H2 batch, the viscosity of serum was too high.
H3 batch had all the desired properties that required to fulfil our criteria for hair serum and solved all the problems faced in the previous batches.

VI. FT-IR SPECTROSCOPY

FT-IR analysis is employed to determine the functional groups present in the extract by examining characteristic peak values. The active constituents are identified based on their specific absorption peaks. FT-IR testing of *TRIGONELLA FOENUM-GRAECUM* extract (Figure 6), *MURRAYA KOENIGII* extract (Figure 7), and the final formulation (Figure 8) was carried out at the Centre of Excellence, Vapi. The spectra were recorded across the range of 400 to 4000 cm^{-1}.

VII. PHYTOCHEMICAL SCREENING

The extract of *MURRAYA KOENIGII* and the extract of *TRIGONELLA FOENUM-GRAECUM* is screened for various phytochemical test. Standard methods are used for phytochemical screening.

VIII. RESULTS AND DISCUSSION

8.1. TEST OF SECONDARY METABOLITES BY PRELIMINARY PHYTOCHEMICAL SCREENING TEST

Table 4: Phytochemical screening

Sr No	Name of Test	Inference	
1.	**Test for alkaloids:**	Fenugreek seeds extract	Curry leaves extract
	1. Dragendroff's test	✓	✓
	2. Wagner's test	✓	✓
	3. Mayer's test	✓	
2.	**Test for tannins:**		
	1. Ferric chloride test	✓	✓
	2. Lead acetate test	✓	✓
3.	**Test for flavonoids:**		
	1. Shinoda test	✓	✓
	2. Alkali reagent test	✓	✓
4.	**Test for saponins:**		
	1. Foam test	--	✓
5.	**Test for Terpenoids:**		
	1. Salkowski test	--	✓

Phytochemical screening summaries that extract of *Trigonella Foenum-Graecum, Murraya Koenigii* contains Alkaloids, Tannins, Flavonoids, saponins, and Terpenoids.

8.2. FT-IR INTERPRETATION

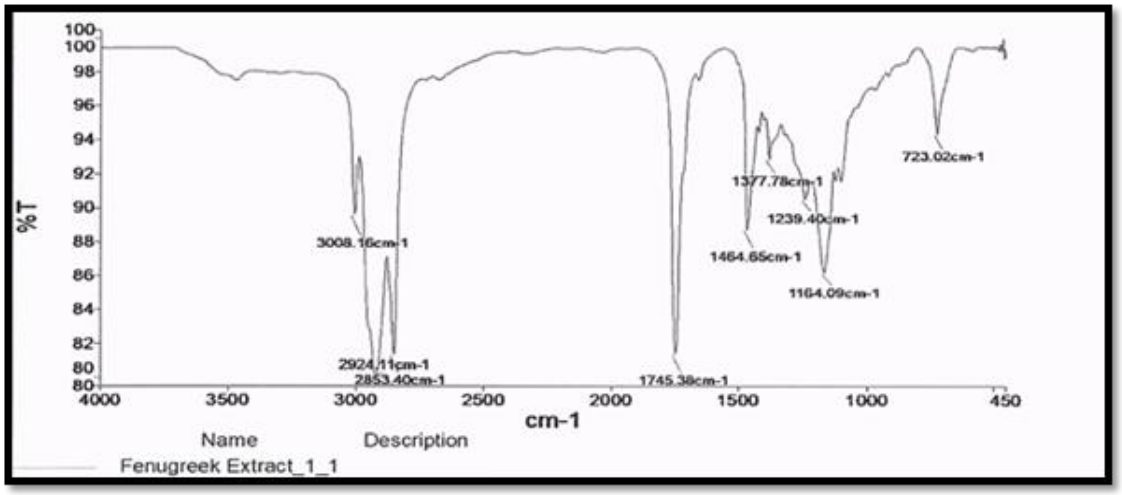

Figure 5: FT-IR graph of Fenugreek seeds extract

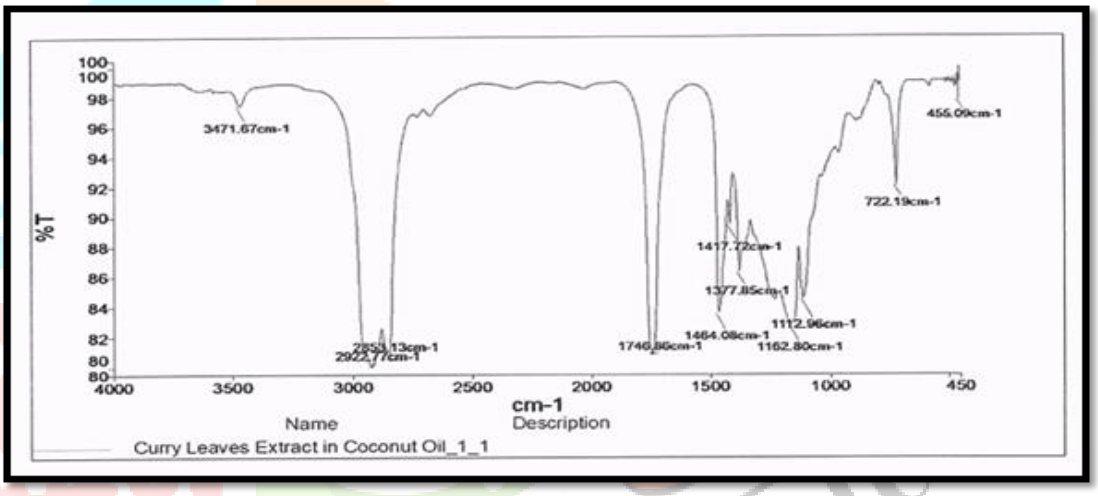

Figure 6: FT-IR graph of Curry leaves extract

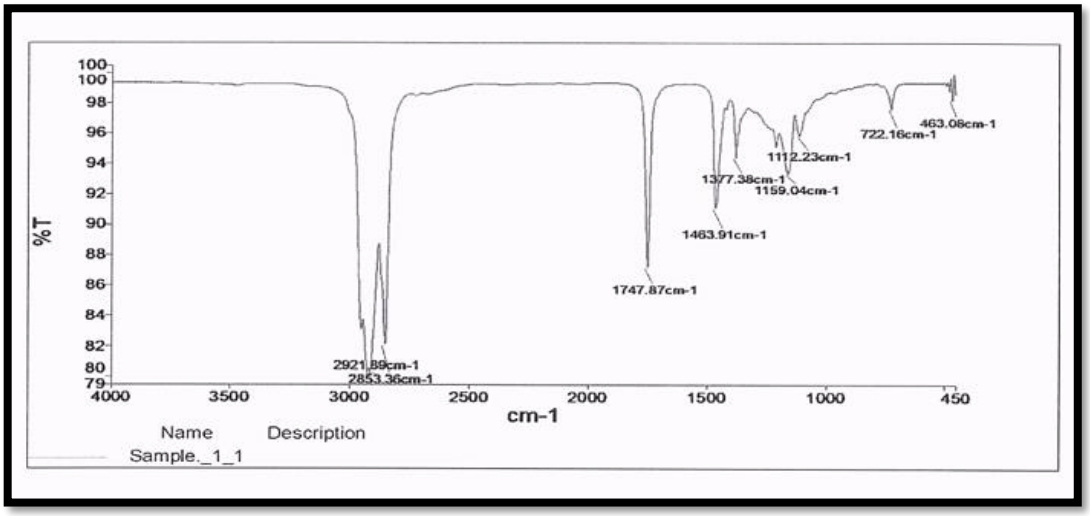

Figure 7: FT-IR graph of Formulation

Table 5: FT-IR interpretation of fenugreek seeds extract

Sr. No:	Functional Group	Standard Range (cm^{-1})	Observed Range (cm^{-1})	Present Chemical Constituent
1	=C-H (Alkene)	3100-3000	3008.16	Unsaturated fatty acids
2	C-H (Aliphatic CH_2)	2950-2850	2924.11	Fatty acids, triglycerides
3	C-H (Aliphatic CH_3)	2950-2870	2853.40	Fatty acids, triglycerides
4	C=O (Ester)	1750-1730	1745.38	Triglycerides
5	C-H Bending (CH_2)	1465	1464.65	Long aliphatic chains
6	C-H Bending (CH_3)	1450-1375	1377.78	Methyl groups
7	C-O (Ester/Carboxyl)	13000-1000	1239.40	Esters or carboxylic acids
8	C-O (Ester)	13000-1000	1164.09	Esters
9	$(CH_2)n$	900-690	723.02	Long aliphatic chains (fatty acids)

Table 6: FT-IR interpretation of curry leaves extract

Sr. No	Functional Group	Standard Range (cm^{-1})	Observed Range (cm^{-1})	Present Chemical Constituent
1	O-H stretching	13650-2400	3471.67	Alcohols, Phenols, Carboxylic Acids
2	C-H stretching (Aliphatic)	2950-2850	2922.77	Lipids
3	C-H stretching (Aliphatic)	2950-2850	2853.13	Fatty Acids, Lipids
4	C=O stretching	1750-1730	1746.86	Esters, Carboxylic Acids
5	C-H bending	1465	1464.08	Aliphatic Chains
6	C-O stretching	1300-1000	1417.72	Alcohols, Phenols, Ethers
7	C-H bending	1450-1375	1377.85	Aliphatic Chains
8	C-O stretching	1300-1000	1162.80	Esters, Alcohols, Ethers

9	C-O stretching	1300-1000	1112.96	Esters, Alcohols, Ethers
10	C-H bending	900-690	722.19	Long-chain Alkanes

Table 7: FT-IR interpretation of formulation

Sr. No	Functional Group	Standard Range (cm^{-1})	Observed Range (cm^{-1})	Present Chemical Constituent
1	C-H Stretching (Alkanes)	3000-2850	2921.89, 2853.36	Fatty acids
2	C=O Stretching (Ester/Acid)	1750-1730	1747.87	Esters
3	C-H Bending (Alkanes)	1465-1375	1463.91, 1377.38	Alkanes
4	C-O Stretching	1300-1000	1159.04, 1112.23	Alcohols, ethers, or esters
5	(CH2)n (Alkanes)	900-690	722.16	Long-chain alkanes

The FT-IR analysis of the fenugreek seed extract, curry leaves extract, and the final formulation confirmed the presence of fatty acids, triglycerides, esters, unsaturated fatty acids, alcohols, and phenolic compounds, as indicated by characteristic peaks such as C–H stretching around 2924, 2922, and 2853 cm^{-1}, C=O stretching near 1745–1747 cm^{-1}, O–H stretching at 3471 cm^{-1}, and C–O stretching between 1239–1112 cm^{-1}. These signals demonstrate that the serum contains natural lipid-based and bioactive constituents contributing to moisturizing, conditioning, antioxidant protection, and forming a protective film on the hair. Overall, the results validate that the formulation is suitable as a plant-derived hair serum intended to nourish the scalp, reduce frizz, and improve hair health.

8.3. EVALUTION PARAMETERS OF HERBAL HAIR SERUM

Table 9: Evaluation parameters

SR. NO.	PARAMETERS	RESULT
1.	Appearance	Mustard yellow
2.	pH	5.06
3.	Viscosity	9 cp
4.	Texture	Light weight
6.	Stability	Stable
7.	Moisturizing effect	Leaves hair hydrated

8.	Skin irritation	No irritation

8.4. LABEL

Figure 8: Label

IX. CONCLUSION

The study successfully formulated and evaluated a herbal hair serum utilizing fenugreek seeds and curry leaves extracts, complemented by jojoba oil, coconut oil, and vitamin E. The serum proved effective in moisturizing the scalp, strengthening hair follicles, and enhancing overall hair texture and shine. Its natural antioxidant and anti-inflammatory properties contributed to scalp health and the prevention of premature graying.the results support the use of plant-based, phenolic-rich extracts as viable and effective alternatives to synthetic ingredients in hair care products. The developed herbal serum not only addresses common hair and scalp issues but also meets the growing consumer demand for eco-friendly, safe, and effective cosmetic solutions.

CONTENT	TITLE OF FIGURE AND TABLES
Figure 1	Hair serum
Figure 2	Fenugreek seeds
Figure 3	Curry leaves
Figure 4	Different batches of herbal hair serum
Figure 5	FT-IR graph of fenugreek extract
Figure 6	FT-IR graph of curry leaves extract
Figure 7	FT-IR graph of formulation
Figure 8	Label
Table 1	Materials used for formulation
Table 2	Different batches of herbal hair serum
Table 3	Phytochemical screening
Table 4	FT-IR interpretation of fenugreek extract
Table 5	FT-IR interpretation of curry leaves extract

Table 6	FT-IR interpretation of formulation
Table 7	Evaluation parameters

X. ACKNOWLEDGEMENT

- I am extremely grateful to **Dr. Arindam Paul**, Principal of ROFEL Shri G.M. Bilakhia College of Pharmacy, Vapi, for providing the necessary facilities and a supportive environment to carry out this project on the formulation and evaluation of a herbal hair serum. I would also like to express my sincere appreciation for all the experiences we have shared throughout our college years—our dedication, perseverance, and growth have shaped us both personally and professionally. Although the journey has presented challenges, it has equally offered valuable learning and discovery.
- I would like to extend my heartfelt thanks to **Ms. Rajvi Mahida**, our project guide, for her exceptional guidance, encouragement, and insightful advice throughout this work. Her expertise and patient support were instrumental in navigating the complexities of this formulation study. I am truly grateful to be part of a collaborative team that continuously motivates and empowers each other. Through effective communication, mutual respect, and a shared commitment, our team was able to address obstacles and successfully complete this project.

XI. REFERNCE

1. Kokate CK. Textbook of Pharmacognosy. Nirali Prakashan, 52nd Ed., Pune, pp. A-22–A-27.
2. Anusha R et al. Formulation and evaluation of herbal hair serum – A review. *Int J Basic Clin Pharmacol* **2023**;12:759–765.
3. Nasir NN et al. Extraction of essential oil from M. koenigii leaves. *J Appl Sci* **2016**;11(4).
4. Bhusal D, Thakur D. Curry leaf: A review. *Rev Food Agric* **2021**;2(1):36–38.
5. Akbari S, Abdurahman N. Extraction and antioxidant activity of fenugreek seed oil. *Mater Sci Energy Technol* **2019**;2(2):349–355.
6. Divakar S et al. Extraction of fenugreek seed – A review. *Int J Pharm Sci* **2024**; 2:461–66.
7. Tiwari R et al. Herbal hair serum development. *Open Dermatol J* **2022**;15(1):52–58.
8. Avishkar K, Rohan J. Fenugreek seed oil characterization. *Int J Adv Int Open*.
9. Gaonkar VP et al. Standardization of fenugreek seeds. *Indian J Pharm Educ Res* **2020**;54(4):1072–1079.
10. Penkar MG et al. Herbal hair serum evaluation. *Res J Pharmacogn Phytochem* **2023**; 20:105–110.
11. Shende HD et al. Herbal hair serum using rosemary. *World J Pharm Res* **2015**;13.
12. Ippalwad S et al. Herbal hair serum formulation. World J Pharm Res 2023; 12:1033.
13. Jhajhria A, Kumar K. Medicinal uses of fenugreek. *Int J Pharm Sci Rev Res* **2016**;41(1):194–201.
14. Jadhav A. M. koenigii and T. foenum for hair growth. *Int J Pharmacogn Clin Res* **2023**;5(2):04–11.
15. Yasothai R. Fenugreek seed composition. *Pharma Innov J* **2021**;10(7):944–47.
16. Swathi R, Gomathy G. Phytochemicals in fenugreek microgreens. *Int J Novel Res Dev* **2024**;9(11):b201–b213.
17. Khedkar AV et al. Fenugreek oil characterization. *Int J Adv Res Sci Commun Technol* **2024**;4(5):341–46.
18. Stanley MCI et al. Microbial contamination in salons. *IOSR J Dent Med Sci* **2014**;13(7):22–27. 19.

19. Pandhi D, Khanna D. Premature graying of hair. *Indian J Dermatol Venereol Leprol* **2013**; 79:641–753.
20. Trüeb RM. Oxidative stress and hair aging. *Int J Trichology* **2009**;1(1):6–15.
21. Bhoir SM et al. M. koenigii pharmacology. *Int J Res Publ Rev* **2024**;5(12):987–1003.
22. Rajvanshi R, Mittal K. Curry leaf phytochemicals. *Int J Sci Res* **2018**;7(11):366–367.
23. Ghadge D et al. Techniques for curry leaf extraction. *Int J Adv Res Sci Commun Technol* **2024**;4(2):442–446.
24. Devi NV et al. Herbal hair gel with curry leaf. *Int J Pharm Sci Rev Res* **2024**;84(1):125–131.
25. Priya RM et al. M. koenigii essential oil composition. *Avicenna J Phytomed* **2014**;4(3):200–214.
26. Igara CE et al. Nutritional profile of M. koenigii. *J Pharmacogn Phytochem* **2016**;5(6):67–69.
27. Singh S et al. M. koenigii – A miracle plant. *Indian J Sci Res* **2014**;4(1):46–52.
28. Bhusal D, Thakur DP. Curry leaf: A review. *Rev Food Agric* **2021**;1(1):36–38.
29. Chatwal GR., Anand SK. Instrumental methods of chemical analysis; 5th Edn; Himalaya publishing house, Mumbai, **2002**, pp 2149-2184.
30. Pavia Dl., Lampman GM., Kriz GS. Introduction to Spectroscopy; 3rd Edn; CBS Publishers and distributors, New Delhi, **1997**, pp 15-104, 353.
31. Singh V, Sahu D, Singh D, Sahu GK. Formulation and evaluation of an herbal hair serum: A comprehensive review. *Int J Pharmacogn Life Sci*. **2024**;5(2):113-117.
32. Shinde SJ, Kute CG, Udapurkar DP, Lonare K. Formulation and Evaluation of Herbal Hair Serum. *Int J Creat Res Thoughts*. **2023**;11(6): e131-e135.
33. G. M. S. El-Baky. FTIR and raman spectroscopic study of fenugreek (Trigonella foenum graecum L.) seeds. *J Appl Spectrosc*. **2005**;72(1):111.