International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 **ijppr.humanjournals.com** ISSN: 2349-7203

Scalp Guard: Formulation and Evaluation of Antibacterial Herbal Hair Gel: Formulation of *Ocimum sanctum*-Based Antibacterial Hair Gel for Scalp Care

Nabamita Sen[1,2*], Fowad Khurshid[3], M. Ganga Raju[4], Vaidehi Sammanwar[5], Jampani Tejaswi[6], V. L. Meghana[7], Shreya Shakkari[8]

1. Ph.D. Research Scholar, Institute of Biomedical Education and Research, Mangalayatan University, Aligarh, U.P. India.
2. Assistant Professor, Gokaraju Rangaraju College of Pharmacy, Hyderabad. India.
3.Principal, Professor, Institute of Biomedical Education and Research, Mangalayatan University, Aligarh, U.P. India.
4.Principal, Professor, Gokaraju Rangaraju College of Pharmacy, Hyderabad. India.
5, 6, 7,8. Students, Gokaraju Rangaraju College of Pharmacy, Hyderabad. India.

Received: 21 April 2026 Revised: 12 May 2026 Accepted: 22 May 2026

ABSTRACT

The present study was undertaken to formulate and evaluate a herbal hair gel using Ocimum sanctum (Tulsi) extract and to assess its physicochemical and antimicrobial properties. The hydro-alcoholic extract of Ocimum sanctum leaves was prepared by cold maceration and subjected to preliminary phytochemical screening. Two herbal hair gel formulations were developed using Carbopol 934 (F1) and Xanthan gum (F2) as gelling agents, followed by incorporation of the extract (15% w/w). Both formulations were evaluated for organoleptic characteristics, pH, spreadability, viscosity, washability, consistency, and antimicrobial activity. The prepared gels exhibited acceptable appearance, homogeneity, non-sticky consistency, and good washability. The pH values of the formulations were found to be within the physiologically acceptable range (5.34–6.76), indicating suitability for topical application. The optimized formulation showed satisfactory spreadability (5.5 cm) and viscosity (approximately 2500 cps). Antibacterial activity was assessed against Escherichia coli using the agar well diffusion method. The Xanthan gum– based formulation (F2) demonstrated a higher zone of inhibition (15 mm) compared to the Carbopol 934 formulation (10 mm) and was comparable to the marketed gel (14 mm). Overall, the Xanthan gum–based herbal hair gel exhibited superior physicochemical characteristics and enhanced antimicrobial activity. The findings suggest that Ocimum sanctum–based herbal hair gel can serve as a safe, effective, and natural alternative to conventional hair care products. Further studies involving stability assessment and extended antimicrobial screening are recommended to support its potential for cosmetic application.

Keywords: Antibacterial activity, Zone of inhibition, Spreadability

INTRODUCTION

A gel is a semi-solid system where a liquid phase is confined inside a network of colloidal particles or polymers that are cross-linked in three dimensions. Gels are relatively newer class of dosage form created by entrapment of larger amount of aqueous hydro-alcoholic liquids in a network of colloidal solid particles which may consist of inorganic substances such as aluminum salts or organic polymers of natural or synthetic origins. The USP defines gels (sometimes called jellies) as semisolid systems containing either suspensions made up of small inorganic particles, or large organic molecules interpenetrated by a liquid. Gels are becoming more popular now a days because they're more stable and can also provide controlled release than other semisolid preparations. The gel formulations can provide better absorption characteristics and hence the bioavailability of drugs. [2][7][8][10]

Herbal cosmetics are produced from naturally available, plant-derived ingredients without synthetic or dangerous chemicals. Herbal hair gels are gentler and safer for the skin, non- greasy, hypoallergenic, non-toxic, less prone to irritation and pore clogging. Herbal drugs are easily available, inexpensive, safe, and efficient, with few adverse effects. Herbal hair gels offer a natural alternative to chemical-based styling products. They use plant-based ingredients that nourish and strengthen hair while minimizing irritation and damage. These gels are free from harmful chemicals, provide hydration, reduce frizz, and are more eco-friendly. Advantages of using herbal ingredients are: Tulsi-strengthening roots, making hair thick, aloe vera- moisturizes, neem-cleanses, amla-gives Shine, hibiscus-conditions, fenugreek-fortifies roots, and flaxseed-adds smoothness, curry leaves- Stimulate growth, calm the scalp and add color intensity.[3][5]

International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 ijppr.humanjournals.com ISSN: 2349-7203

MATERIALS AND METHODS

PLANT PROFILE OF OCIMUM SANCTUM (Tulsi):

Common Name: Holy Basil, Sacred Basil,Tulsi, Surasa

Synonym: Ocimum tenuiflorum L., Ocimum album Roxb. , Ocimum sanctum var. Tenuiflorum Tulsi is an aromatic shrub that is native to the tropical regions of the eastern continent. It belongs to Kingdom: Plantae, Subkingdom: Viridiplantae, Division: Tracheophyta, Subdivision: Spermatophyta, Class: Magnoliopsida and the Lamiaceae family of basil (tribe ocimeae) and is believed to have originated in north central India.It is an annual herbaceous plant that is widely grown throughout India. It is considered sacred by Hindus. Tulsi enhances blood flow, keeps your scalp cool, lessens irritation, and encourages hair growth. It has a pungent taste and fragrant smell. The numerous therapeutic benefits that the tulsi plant offers make it extremely significant to mankind. Studies reveal that tulsi possesses a unique combination of properties, such as antimicrobial (including antibacterial, antiviral, antifungal, antiprotozoal, antimalarial, and anthelmintic), mosquito repellent, anti-diarrheal, anti-oxidant, anti-cataract, and anti-inflammatory properties. It is rich in vitamin K and antioxidants. Hair loss can be effectively treated with tulsi. It is a crucial component of an herbal remedy for hair loss.

Uses: Strengthening the hair roots, thereby curbing hair fall, preventing bacterial, fungal infections, cough, cold, sore throat, bronchitis, and asthma, antipyretic, anti-inflammatory and analgesic.

Fig 1: Ocimum sanctum

Chemical constituents:

Eugenol, methyl eugenol, linalool, and camphor, terpenoids (ursolic acid, oleanolic acid), phenolic compounds (rosmarinic acid), flavonoids (orientin, vicenin), tannins and saponins.

Adulteration testing:

Total Ash Value:

- Dry the leaves (air dried/oven dried) at 105^0c.
- Accurately weigh about 2-3g of the powder, into a tared silica or porcelain crucible.

- Gently ignite at a low flame initially, then gradually increase temperature.
- Cool in the desiccator and weigh.

%Total Ash = weight of ash/weight of original sample x 100

Calculation:

Weight of empty dish = 31.750g Weight of drug taken = 2g

Weight of dish + Ash (after incineration) = 32.02g Weight of ash=32.02-31.750g

= 0.27g

$$\textbf{Total ash value} = \frac{0.27}{2} \times 100$$

= 13.5% w/w

(According to I.P, Volume- III, Pg no. 4310, N.M.T- 15.0% w/w)

Fig 2: Ash value determination

MATERIALS AND METHODS

Collection of plant material: Tulsi extract was prepared by cold maceration technique. Ocimum Sativum was collected from the Gokaraju Rangaraju college of Pharmacy campus Medicinal Garden. Fresh leaves were plucked from the plant and used for extraction.

Fig 3: Dried Tulsi leaves

Preparation of leaf extract of Ocimum Sanctum:

The collected fresh leaves were washed with water and dried in the shade for 2 -3 days. The dried leaves were then made into a coarse powder which was stored in an airtight bag.

50g powder was weighed and by cold maceration technique, it was soaked in equal amounts of water and ethanol (hydro-alcoholic mixture i.e 50:50). 125ml of ethanol and 125ml of water was used. Then, it was left at 25º C, room temperature for 72 hours. Every 24 hours, it was stirred gently.

After 72 hours, it was filtered using Whattaman no.1 filter paper. The macerated extract was concentrated using Rotary Evaporator.

Rotary Evaporator:

A rotary evaporator (commonly referred to as a rotavap or rotovap) is a laboratory instrument widely used for the efficient and gentle removal of volatile solvents from samples under reduced pressure. The device operates by combining vacuum application, controlled heating, and continuous rotation of an evaporation flask, which collectively lower the solvent boiling point, increase the effective surface area, and enhance the evaporation rate while minimizing thermal degradation.

During operation, the sample is rotated in a round -bottom flask under reduced pressure and mild heating, causing the solvent to vaporize at a lower temperature. The solvent vapors are condensed by a cooling system and collected in a receiving flask, while the concentrated residue remains in the evaporation flask. Compared with atmospheric evaporation or conventional distillation, rotary evaporation is faster, more energy-efficient, and allows better control over temperature-sensitive compounds. Consequently, rotary evaporators are extensively used for solvent removal, concentration, crystallization, drying, separation, and solvent recovery across chemical, pharmaceutical, and biotechnology applications.

The herbal extract after cold maceration was found to be 45ml, after using Rotatory evaporator for 10-15mins it was concentrated to 13ml and then transferred and stored in an air-tight container as used for further formulations.

Fig 4: Tulsi extract

Fig 5: Rotary Evaporator

TEST FOR PHYTOCONSTITUENTS:

Ocimum Sanctum:

Table 1: Phytochemical profile of Ocimum Sanctum

S.NO	PHYTOCONSTITUENT	OCIMUM SANCTUM
1.	Alkaloids	✓
2.	Glycosides	✓
3.	Flavonoids	✓
4.	Saponins	✓
5.	Phenolic compounds	✓
6.	Tannins	✓
7.	Terpenoids	✓

Table 2: Phytochemical screening of Ocimum Sanctum

Fig 6: Phytoconstituent tests of tulsi

Preparation of Base gel:

Two Herbal hair gel formulations were prepared by using Carbopol 934 and Xanthan gum.

Carbopol 934 profile: Carbopol 934 (Carbomer) is a white, cross-linked polyacrylic acid polymer designed for high-viscosity, stable emulsions and gels. It acts as an efficient thickener and suspending agent. It is ideal for lotions, creams, and gels in pharmaceuticals and cosmetics, offering stability.

Molecular Formula: $C_5 H_{10} O_2$

Molecular Weight: 102.13 g/mol.

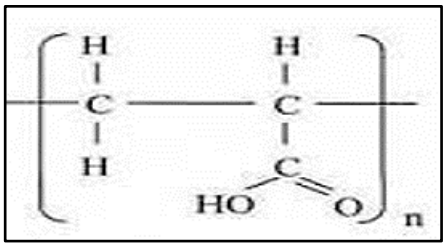


Fig 7: Structure of Carbapol 934

Carbapol 934: 2g of Carbapol 934 was accurately measured and 65ml distilled water was added to it for the required consistency, mixed using a magnetic stirrer by continuously stirring at 1200rpm for 1hour.

Later, the required quantities of triethanolamine, methyl paraben, propylene glycol were added to formulate the base gel.

Fig 8: Carbopol 934 base gel

Xanthan gum Profile:

Xanthan gum is an effective thickening agent, stabilizer and also used for binding. It is a non -toxic gelling agent. It is a natural polysaccharide with high molecular weight, high stability across pH/temperature ranges, and high viscosity at low concentrations. It is used in Toothpaste, lotions, gels and creams.

Molecular Formula: $(C_{35}H_{49}O_{29})_n$

Molecular weight: 2 to 50 million g/mol

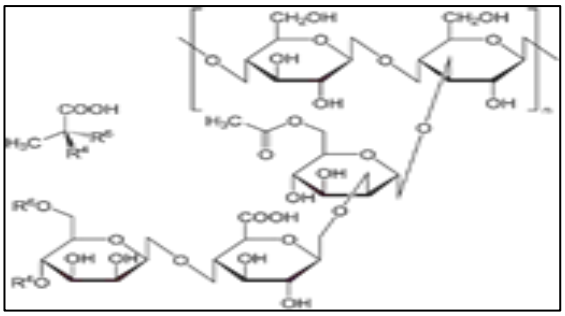


Fig 9: Structure Xanthan gum

Xanthan gum: 2g of Xanthan gum was accurately measured and 95ml distilled water was added to it for the appropriate consistency, mixed using a magnetic stirrer by continuously stirring at 1200rpm for 1hour. Later, the required quantities of triethanolamine, methyl paraben, propylene glycol were added to formulate the base gel.

Fig 10: Xanthan gum base gel

International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 ijppr.humanjournals.com ISSN: 2349-7203

Incorporation of the extract: (15% w/w)

4ml of Ocimum sanctum extract is added in 20g of Carbopol 934 gel. 4ml o.s extract is added in 20g of Xanthan gum gel.

Table 3: Formulation of base gel with two different gelling agents

Formulation 1	Quantity	Formulation 2	Quantity
Xanthan gum	2gm	Carbopol 934	2gm
Triethanol amine	0.5ml	Triethanol amine	0.5ml
Methyl paraben	0.2ml	Methyl paraben	0.2ml
Propylene glycol	5ml	Propylene glycol	5ml

Fig 11: Formulation 1

Fig 12: Formulation 2

EVALUATION PARAMETERS OF HERBAL HAIR GEL:

Various tests have been performed on herbal hair gel like color, pH, spreadability, washability, viscosity, zone of inhibition and consistency.

1. Physical properties -

a) **color-** The color of ocimum sanctum gel was greenish brown in color.

b) **odor-** The odour of the gel is aromatic, slightly minty, distinct herbal smell from tulsi.

c) **Consistency-**The herbal gel was found to be homogenous, non-sticky, lightweight, good appearance and consistency.

2. PH -

1gm of gel is dissolved in to 100ml of distilled water and stored for two hours. Electrodes were completely dipped into the hair gel formulations and pH was noted. The measurement of pH of each formulation was done in triplicate and average values were calculated. [13]

The pH values of the formulations of xanthan gum gel -5.34 and carbopol 934 gel - 6.76. (According to I.P- 4.5 to 6.8 pH).

Fig 13: pH of Xanthan gum gel

Fig 14: pH of Carbopol 934 gel

3. Spread ability -

Spread ability tests has been performed on the herbal gel by placing the required amount of gel sandwiched between the two slides and a required weight is placed on the slides. Following the removal of the weight, the spread circle's diameter was measured at different points. Spreadiability was calculated by using formulas. [23]

$$S = M \times L/T$$

S=Spreadability

M= weight placed on the slide, L= diameter of circle in cm T= Time (in sec.)

The spreadability values of the optimized formulation was found to be 5.5cm. (According to I.P- 5-7cm)

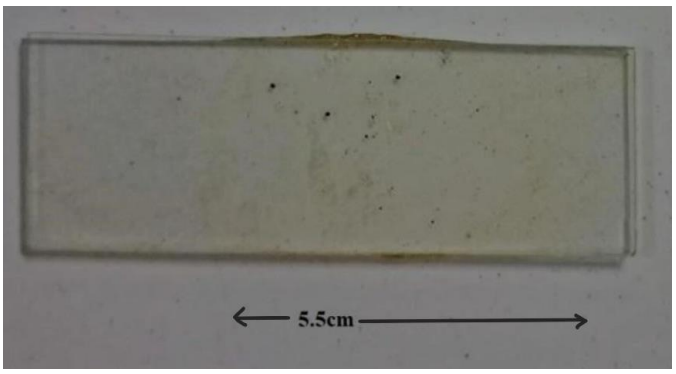


Fig 15: Spreadability

4. Washability -

The prepared herbal gel was applied, and it disappears clearly after washing with water. To test the gel's washability, add a tiny amount to the rough surface of an old glass slide and allow it to dry. Once dried, pour water over the gel to watch how quickly it washes off. The rough surface of the glass slide resembles the texture of skin. [14]

5. Viscosity -

The Brookfield viscometer determines viscosity by rotating a spindle in gel. Spindle number 64 was used to measure a gel sample at room temperature at 50 rpm after it was put in the proper spindle container. The optimised formulation viscosity was found to be 2500cps (According to I.P – 2000 to 150,000 cps). [14]

International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 ijppr.humanjournals.com ISSN: 2349-7203

Fig 16: Brookfield Viscometer

6. Zone of inhibition Antimicrobial activity-

The zone of inhibition is a way to assess the gel's ability to prevent growth of bacteria and fungi. The effect of herbal gel was studied on E.coli by the disc plate method.

Table 4: Preparation of nutrient agar media

COMPOSITION	WORKING FORMULA
Beef extract	3g
peptone	5g
Sodium chloride	5g
Agar	15g
Distilled water	1000ml

PREPARATION OF NUTRIENT AGAR MEDIA

1. Weigh all the required quantity of ingredients by using digital weighing balance.
2. Transfer the weighed ingredients int o a conical flask.
3. Boil it for 10 minutes with continuous stirring until all the ingredients get dissolved.
4. After cooling, sterilize in an autoclave at 121 ℃ for 15 minutes.
5. Pour nutrient agar into each petri-plates and leave plates on the sterile surface of laminar air flow until the agar media solidifies.

Fig 17: Laminar air flow

Laminar air flow- Laminar Air Flow is defined as a system that uses the unidirectional and consistent movement of filtered air at a uniform speed throughout a specified workspace to ensure minimal particle turbulence and sterility. Laminar Air Flow technology is the basis of contamination control in critical environments.

Preparation of inoculum

Uniform suspension of microorganism (E. coli) is transferred in 25ml distilled water into a conical flask, with aseptic condition for 24 hours.

DETERMINATION OF ZONE OF INHIBITION

PROCEDURE:

The zone of Inhibition should be performed in Laminar Air flow to prevent contamination and promote bacterial growth. The agar media is cooled and is poured into the petri dishes, and the inoculum of E. coli was prepared and streak plate was performed under aseptic conditions.

1. Leave the petri dishes aside until it solidifies, after it solidifies make the holes in the middle of media with a borer.Once the wells are formed, pipette out the extracts int o the wells and close the lid.

2. Place the petri dishes in an incubator for 24 hours, which helps in bacterial growth and prevent contamination. After 24 hours, remove the petri plates and check for growth and mark it accordingly.

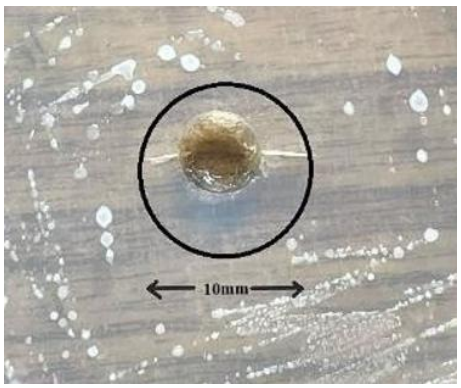
3. Leave the petri dishes aside until it solidifies, after it solidifies make the holes in the middle of media with a borer.

4. Once the wells are formed, pipette out the extracts int o the wells and close the lid.

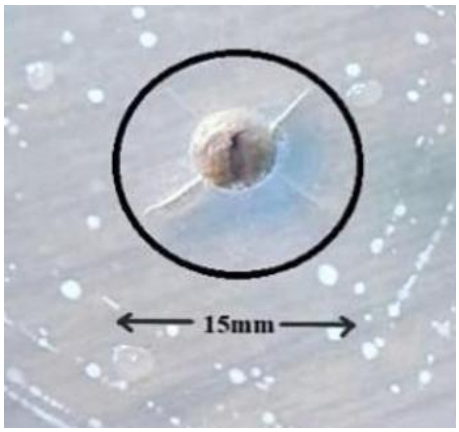
5. Place the petri dishes in an incubator for 24 hours, which helps in bacterial growth and prevent contamination. After 24 hours, remove the petri plates and check for growth and mark it accordingly.

International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 ijppr.humanjournals.com ISSN: 2349-7203

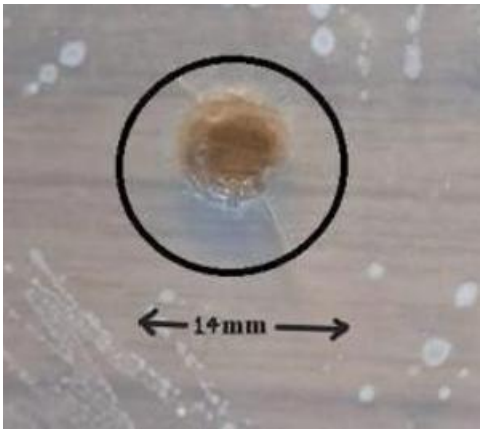
FORMULATIONS ZOI



F1: - Formulation with E. coli



F2:- Formulation with E. coli



F3: - Formulation with E. coli

Fig 18: Diagrammatic Representation of zone of inhibition

Table 5: Zone of inhibition of Antibacterial activity of herbal hair gel

S.NO	FORMULATIONS	E. COLI
1	F1 (Extract + carbopol934)	10mm
2	F2 (Extract + xanthan gum)	15mm
3	F3 (marketed gel)	14mm

CONCLUSION

The present report was aimed at the formulation and evaluation of herbal hair gel using Ocimum Sanctum extract. The extract was prepared by cold maceration using hydro -alcoholic solvent system and subjected to phytochemical screening, which confirmed the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, glycosides and phenolic compounds, indicating its therapeutic and antimicrobial potential. Herbal Formulations were made with specified drug such as Ocimum Sanctum. The Phytoconstituents testing was done and optimized with anti-bacterial activity. Evaluation parameters such as colour, pH (5.34-6.76), consistency, washability, spreadability (5.5 cm), viscosity (~2500cps) and Zone of inhibition were recorded. A notable result was observed in the Zone of inhibition of two gelling agents used (Carbapol 934 and Xanthan gum) being 10mm and 15mm respectively. The zone of inhibition was compared with marketed product which was found to be 14mm. Xanthan gum gel was found to be most potent among all the gels.This shows its suitability as a natural and effective herbal hair gel. Among the two formulations, Xanthan gum has shown excellent evaluation parameters having very good consistency, viscosity, spreadability, pH and antimicrobial activity. The study confirms the potential of Ocimum sanctum–based formulations as safe cosmetic alternatives. Further studies involving long-term stability, broader antimicrobial screening, and user acceptability may help in product development and commercialization.

REFERENCES

1. Vedank Jadhav, Saakshi Kamble, Shreyash Kamble and Ms. Rini Punathil .Formulation and Evaluation of herbal hair gel of Neem and curry leaves. World Journal of Pharmaceutical Research. 2025 Aug;14(16):666-695.
2. Jyothi S, Venkata Ramana B.Flaxseed Based Rice Water Keratin Treatment Hair Gel. International Journal of Current Trends in Pharmaceutical Research.2025 Aug; 13(1)
3. Shrutika S. Nimkar,Yashwant S. Deshmukh.Formulation And Evaluation Of Herbal Hair Gel From Flaxseed Extract.International Journal of creative Research thoughts.2024 July; 12(7)
4. Kshitije Bhardwaj, Indu Mittal, Divya Pathak.Herbal Hair Gel: Formulation And Evaluation Of Physical Parameters.World Journal of Pharmaceutical Research. 2024 March; 13(9)
5. N. Venuka Devi, Bhanu N, Shashank K. Formulation and Evaluation of Herbal Hair Gel Containing Curry Leaf Extract and Flax Seed Extract.International Journal of Pharmaceutical Sciences Review and Research. 2024 Nov; 84(11)
6. Mahima Gupta, Lesha Patel, Divyesh Rohit, Rajivi Mahida. Formulation and Evaluation of Hibiscus Flaxseed Herbal Hair Gel. International Journal of Creative Research Thoughts. 2024 February; 12(2)
7. Vaishnavi B., Salunke, Pratiksha B. Holap, Shubhda S. Dube, Dr. Rajendra M. Kawade. Formulation and Evaluation of Flaxseeds Hair Gel. International Journal for Research in Applied Science & Engineering Technology. 2024 June;
8. Jahnavi Patidar, Anjula Patidar, Ujjwal Kushwah, Shashwat Rathore, Maksud Pathan. Formulation and Evaluation of Herbal Hair Gel. International Journal of Creative Research Thoughts. 2024 April; 12(4)
9. Sunil Mishra, Shashank Tiwari, Sushil Kumar Pal and Himanshu.Formulation and assessment of herbal hair gel: A natural solution for men's hair care. International Journal of Pharmaceutical Research and Development. 2024; 6(2)
10. Devka Narayan Ghodke, Tejaswini Aniket Dhawale.Formulation and evaluation of Herbal anti- dandruff hair gel.International Journal Of Current Science.2024;14(2)334 -349
11. Shubhangi Kharat, Divya Bagade, Dipti Bhosale , Pradnya Channa , Pratiksha Dhainje , Snehal Ghatule.Formulation and evaluation of Polyherbal Herbal hair gel.International Journal of creative Research thoughts.2024;12(2)
12. Mallamma T, Prakash Kumar B, Athishay Suchindar, Pragathi Y, Meghana C, Hemalatha K J. Formulation and Performance of Polyherbal Antidandruff Hair Gel: A Multifaceted Solution. Asian Journal of Pharmaceutical Research and Health Care. 2024 March; 16(1)
13. M. Mamta, Farswan A.S, Patil S.M. Formulation and evaluation of Herbal hair gel by using flaxseed And chia seed extract.International Journal of creative Research Thoughts. 2023 June; 11(6):f769- f780
14. Kirtimala Falak*, Akshay Nemade, Mitali Patil, Archana Hiwase, Geeta Sahu, Arti Ingole. Formulation And Evaluation Of Herbal Antidandruff Gel. World Journal of Pharmaceutical Research. 2023 August; 12(18):759-769.
15. Sreethu K Sreedharan, Abdulla Naseeh E.S Hasna K.H, Krishnaveni P, Tibin. Formulation and Evaluation of Herbal Anti-Dandruff Hair Gel. International Journal of Pharmacy and Pharmaceutical Research. 2023 June; 27(3):434 -439
16. Emmanuel Uronnachi , Chidiogo Atuegwu, Chukwuebuka Umeyor ,Calistus Nwakile , Josephat Obasi , Chidalu Ikeotuonye ,

Anthony Attama. Formulation and evaluation of hair growth enhancing effects of oleogels made from Rosemary and Cedar wood oils. Scientific African. 2022 Feb; 16
17. Ramakrishna S , Gopikrishna U. V. Formulation and Evaluation of Herbal Hair Gel. Scholars International Journal of Traditional and Complementary Medicine. 2022 Feb;5(2):28 -32
18. Mona M.Hashem 1,DaliaAttia,Yomna Hashem ,Moataz S.Hendy,SafaAbdelbasset,farahAdel &Maha M.Salama.Rosemary and neem: an insight into their combined anti-dandruff and anti-hair loss efficacy. Scientific Reports 2024;14
19. Nilofar Khan, Prajwal Jadhav, Srushti Jagadale, Komal Kachare,Shravani Kamble, Shivani Gandhe,Rupali Yewale, Dr.Mohan Kale Shubhangi Kshirsagar.Formulation and evaluation of herbal hair gel formulation. Journal of pharmacognosy and phytochemistry 2022 Dec; 11(1):32-36
20. Ponam Madan, Bharat Rathi, Renu Rathi, Sonali Wairagade,Dhiraj Zade.Pharmaceutical Development, Standardization and Clinical Evaluation of Efficacy of a Polyherbal Hair- Pack andHair Gel in Dandruff Control. Journal of pharmaceutical research international 2021 June;33(31B):69-78
21. Usnale Ashlesha, Jaiswal Naresh, Chavan Gitanjali, Zambre Krushna, Kamble Rohini, Gude Uday.Formulate and Evaluate Herbal Hair Gel.International Journal of Pharmaceutical Research and Applications 2021 July; 6(4): 417-430
22. Madhur Kulkarni, Vishakha Hastak,Vitthal Jadhav, and Abhijit A. Date. Fenugreek Leaf Extract and Its Gel Formulation Show Activity Against Malassezia furfur. Research Gate 2020 Sept; 18, No. 01
23. Atul S. Sayare*, Aparana D. Sinha, Nishi 0. Sharma, Monika A. Kulkarni, Sonali A. Yerne, Sujata M. Tarange.Formulation and Evaluation of Antidandruff Hair Gel containing Lawsone. Journal of Pharmaceutical Sciences and Research. 2020; 10(1):86 -90
24. Trivedi R.V , Bansod P. G , Taksande J. B , Mahore J. G , Tripurneni S. R , Rai K. R , Umekar M. J.Investigation of hair growth promoting the ability of herbal gel containing Zingiber officinale. International journal of research in pharmaceutical sciences 2019 June; 10(4): 3498 -3507.
25. Resmi Mustarichie, Dolih–gozali, Settings Imam Adi Wicaksono,Feris Dzaky Ridwan Nafis.Comparison Study Of Hair Tonic And Gel Formulation Of Angiopteris Evecta As A Hair Growth Stimulant . International Journal of Applied Pharmaceutics 2019 March 11(4):199 -205

How to cite this article:
Nabamita Sen et al. Ijppr.Human, 2026; Vol. 32 (6): 1-13.

Conflict of Interest Statement: All authors have nothing else to disclose.