iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** IV **Month of publication:** April 2025

DOI: https://doi.org/10.22214/ijraset.2025.69028

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

Review on Semisolid Herbal Hair Gel

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Abstract: ***Safe, efficient, and environmentally friendly herbal formulas have been developed in response to the growing demand for natural and chemical-free hair care products. Using medicinal plants including aloe vera, amla, bhringraj, neem, and hibiscus—all of which are renowned for their therapeutic effects in hair nourishing and scalp health—this study focusses on the creation and assessment of a semisolid herbal hair gel. Glycerin was used to moisturize the gel, triethanolamine was used to alter the pH, and Carbopol 940 was used as a gelling agent. Physical characteristics, pH, viscosity, spreadability, stability, and antibacterial activity were assessed for the produced product. The findings demonstrated that the herbal hair gel has favorable qualities such smooth texture, easy washability, non-greasiness, and outstanding stability. The formula encourages the use of herbal and Ayurvedic cosmetics and provides a viable substitute for synthetic hair gels.***

Keywords: Herbal hair gel, Aloe vera, Amla, Bhringraj, Carbopol 940, Hair care, Natural formulation, Scalp health, Semisolid gel, Ayurvedic cosmetics.

I. INTRODUCTION

A. Background

A person's look and personality are greatly influenced by their hair. Hair care has played a significant role in grooming and personal hygiene customs for generations in a variety of cultures. To keep hair healthy, encourage hair development, and avoid hair-related issues including dandruff, hair loss, scalp infections, and early greying, people have historically turned to natural and herbal therapies. The market for herbal and plant-based formulations has increased significantly in recent years due to growing consumer awareness and a preference for eco-friendly and chemical-free goods [1-2].

Hair gels have become very popular among the many cosmetic hair care products on the market today.

Depending on their components, hair gels are semisolid formulations that may be used for both nourishing and styling hair as well as providing therapeutic advantages. The synthetic polymers, alcohols, and preservatives that are typically included in conventional hair gels can cause problems over time, including dryness, flakiness, damage to the hair shaft, and irritation to the scalp. As a result, there is increasing interest in creating herbal hair gels that nourish the hair and scalp while remaining safe [3-4].

A semisolid herbal hair gel blends the medicinal advantages of herbal ingredients with the visual attractiveness of traditional hair gels. Several herbal extracts that are well-known for their antibacterial, anti-dandruff, hair conditioning, and hair growth-promoting properties are included in these formulations. By ensuring simple application, equal distribution, and good retention on the scalp and hair strands, the semisolid gel foundation improves the effectiveness of the active herbal ingredients [5-6].

II. IMPORTANCE OF HERBAL INGREDIENTS IN HAIR CARE

The ancient Ayurvedic and Unani scriptures that describe different plants and their parts—leaves, roots, seeds, flowers, and fruits—as efficient treatments for fostering hair health are where the use of herbs in hair care originated. Herbs that are frequently utilized in hair gels include:

Aloe vera, or Aloe Barbadensis Miller, is well-known for its anti-inflammatory, calming, and moisturizing qualities. Its vitamins, minerals, and enzymes aid in hydrating the scalp and encouraging the development of new hair [7-8]

Alpha hydroxyl acids, vitamin C, and amino acids are abundant in hibiscus (Hibiscus rosa-sinensis). It encourages shiny hair, stops hair loss, and fortifies the roots.

Amla (Phyllanthus emblica): High in vitamin C and a strong antioxidant. It promotes hair development, inhibits premature greying, and lessens hair loss [9].

Ayurvedic medicine has long utilized Bhringraj (*Eclipta Alba*) as a hair tonic. It fortifies hair roots, inhibits dandruff, and encourages hair growth.

Azadirachta indica, or neem, is well-known for its antibacterial, antifungal, and anti-inflammatory properties. It aids in the treatment of dandruff and scalp diseases.

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Rosemary (*Rosmarinus officinalis*): Promotes hair growth, improves blood flow to the scalp, and adds a light scent.
These herbs have several advantages when added to a proper gel basis, such as protecting against environmental damage, promoting hair development, improving hair texture, and nourishing the scalp [10-11].

III. NEED FOR HERBAL HAIR GELS

People are often exposed to pollution, stress, poor food, and harsh hair treatments—factors that negatively impact hair health—as a result of growing urbanisation and changes in lifestyle. The long-term negative consequences of chemical-laden hair products are becoming more and more apparent to the modern consumer. Common synthetic compounds such as silicones, phthalates, sulphate, and parabens have been connected to hormone disturbances, allergic responses, and in severe cases, carcinogenicity [12].
A natural substitute free of such negative effects is provided by herbal hair gels. Herbal gels provide the following advantages:

1) Biocompatibility and Safety: Herbal components are often more biocompatible and less likely to cause negative responses because they come from natural sources.
2) Sustainability & Eco-friendliness: Because herbal formulations are biodegradable and employ few synthetic ingredients, they have a smaller environmental effect.
3) Multipurpose: Herbal gels can be used as conditioners, scalp tonics, anti-dandruff products, and hair growth boosters in addition to being used for hair style.
4) Market Demand and Consumer Trust: Due to consumer confidence in natural cures, the herbal and organic cosmetics sector is one of the fastest-growing [13].

IV. SEMISOLID FORMULATION: ADVANTAGES AND APPLICATIONS

A condition of matter that is between solid and liquid and has special functional and physical characteristics is referred to as a semisolid formulation. Herbal hair gels that are semisolid have several benefits [14].

1) Application Ease: The consistency guarantees easy application and improved scalp and hair retention.
2) Controlled Release: By releasing active substances gradually, therapeutic efficacy can be increased.
3) Enhanced Stability: Long-term stability and shelf-life are guaranteed by proper formulation without sacrificing performance.
4) Aesthetic Appeal: Gels that are clear, colored, or naturally tinted and have a pleasing scent are both aesthetically pleasing and easy to apply [15].

V. FORMULATION APPROACH

A careful selection of components and excipients is necessary for the development of an efficient semisolid herbal hair gel. Important formulation elements consist of:

1) Gelling Agents: To provide the appropriate viscosity and texture, materials such as Carbopol, xanthan gum, guar gum, and hydroxylpropyl methylcellulose (HPMC) are frequently utilized.
2) PH Adjusters: Products like as citric acid or triethanolamine are used to keep the pH at a level that is comfortable for the scalp, usually between 4.5 and 6.5.
3) Preservatives: To stop microbial development, natural preservatives like potassium sorbate, sodium benzoate, or antibacterial essential oils are utilized.
4) Humectants and Moisturizers: Glycerin and aloe vera are two examples of ingredients that help hold onto moisture and have a calming impact on the scalp.
5) Herbal Extracts: Depending on the phytochemical profile and intended usage of a particular plant, aqueous, hydro alcoholic, or Ethanolic extracts are utilized [16-17].

VI. EVALUATION PARAMETERS OF HERBAL HAIR GEL

Following formulation, the herbal hair gel is put through a number of assessment studies to guarantee its efficacy, safety, and acceptability by consumers: Assessing color, odour, clarity, consistency, and uniformity are all part of the physical evaluation. Measurement of pH and viscosity guarantees that the gel is consistent and falls within permissible levels for usage on the scalp. Spreadability Test: Assesses hair coverage and ease of application.
Microbial Stability: Assesses the effectiveness of preservatives and microbial contamination. The gel's washability and non-stickiness determine whether it leaves residues and how readily it may be removed.
Hair conditioning test: Verifies post-application softness, manageability, and gloss.

Stability Studies: Evaluate the formulation's stability in various storage scenarios, including real-time and accelerated storage [18-22].

VII. RECENT ADVANCES IN HERBAL GEL FORMULATION

Novel medication delivery methods for hair care have been developed as a result of recent developments in phytopharmaceuticals and cosmetology. Examples of innovations are: Liposomes and Nano emulsions are two technologies that improve the bioavailability and penetration of herbal active ingredients. Hydrogel Systems: Offer longer-lasting active release and improved moisture retention. Green Formulation Techniques: Stress the use of environmentally friendly methods for solvent-free or less solvent-intensive processes. Herbal ingredients can be delivered to the hair root and follicle base with the use of 3D hair follicle targeting. These developments may be used to enhance the effectiveness of herbal hair gels that are semisolid and guarantee that nutrients are delivered to the scalp more deeply [23-25].

VIII. FORMULATION

Selected plant extracts with medicinal and hair-nourishing qualities were used in the formulation of the semisolid herbal hair gel. Amla (hair strengthener), Bhringraj (hair growth promoter), Hibiscus (conditioner and anti-hair fall agent), Neem (antifungal and antibacterial), and Aloe vera (moisturizer and scalp soother) were among the main constituents. Glycerin served as a humectant to hold onto moisture, while Carbopol 940 was utilized as the gelling agent to give the necessary viscosity and texture. To stabilize the gel matrix and neutralize the pH, triethanolamine was utilized. To improve antibacterial stability and scent, preservatives like sodium benzoate and essential oils (such tea tree or rosemary oil) were used. Herb aqueous extracts were made by cold maceration or decoction and added to the gel basis while being constantly stirred to guarantee homogeneity. Physical appearance, pH, viscosity, spreadability, washability, and stability under various storage circumstances were all assessed for the finished product [26-27].

IX. EVALUATION TEST

1) A number of assessment criteria were used to the semisolid herbal hair gel formulation in order to guarantee its performance, stability, and quality.
2) Color, texture, and other organoleptic characteristics were visually inspected. To verify scalp compatibility, the pH was tested using a digital pH meter (optimal range: 4.5–6.5).
3) A Brookfield viscometer was used to measure viscosity in order to evaluate spreadability and consistency.
4) To assess ease of use, the spreadability test was carried out using the glass slide method. By putting the gel to hair and evaluating the residue after washing, washability was examined.
5) In order to guarantee a smooth and consistent result, homogeneity and grittiness were examined.
6) To ensure safety, a little piece of skin was used for the skin irritation test. To make sure the formulation didn't get contaminated, microbial load testing was done. To evaluate shelf-life and formulation integrity, stability tests were carried out in a variety of temperature and humidity settings [28-29].

X. FUTURE SCOPE OF STUDY

The natural cosmetics business has a lot of promise thanks to the development of semisolid herbal hair gel. Future studies might concentrate on using herbal extracts based on nanotechnology for improved effectiveness and scalp penetration. Consumer safety can be guaranteed and treatment claims can be validated by clinical trials conducted on a broader population. Dry, oily, and dandruff-prone scalps are among the hair types for which the formulation may be tailored. Furthermore, sustainable herb procurement and environmentally friendly packaging can raise market value. AI-driven diagnostics and intelligent scalp analysis technologies may potentially be used to create personalized herbal gels that provide people access to hair care products tailored to their specific need [30].

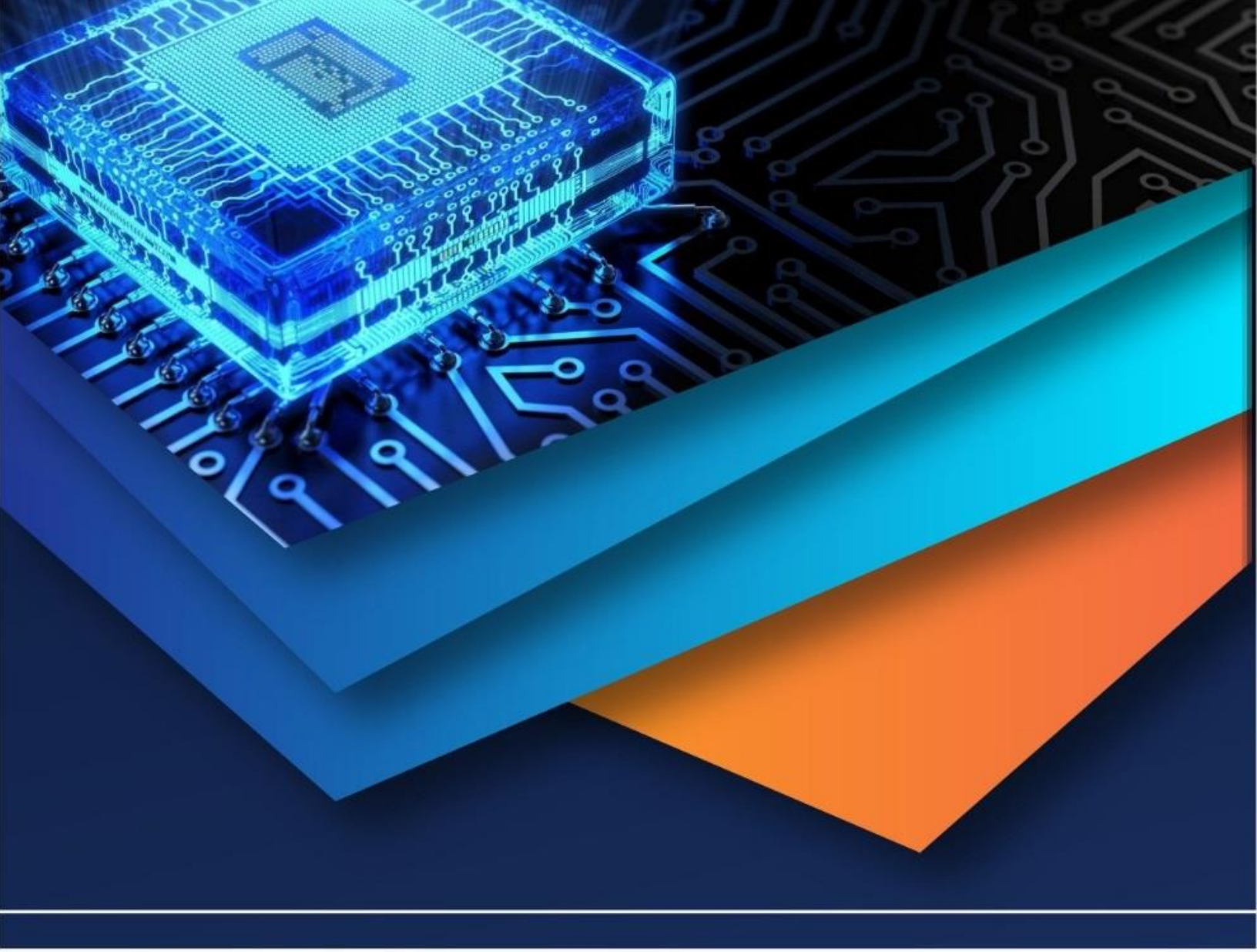
XI. CONCLUSION

The study's formulation of a semisolid herbal hair gel showed outstanding stability and physicochemical properties. The chosen herbal extracts have calming effects on the scalp, improved hair nourishing, and antibacterial protection. Evaluation characteristics like pH, stability, spreadability, and viscosity verified that the gel was suitable for frequent usage without creating accumulation or irritation. Consumer demands for safe, environmentally friendly, and efficient cosmetics are addressed by the herbal hair gel, which is a natural and affordable substitute for conventional synthetic gels. Its potential as a widely used herbal hair care product can be established with more clinical research and market confirmation.

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