

Formulation and Evaluation of Herbal Hair Serum

**Dr. Sonali Uppalwar, Dr. Abhishek Kumar Sen, Mansi N. Gaikar,
Sagar L. Gaikwad, Vijaya R. Gaikwad, Chetan S. Gangoda, Sejal B. Garje.**
Ideal Institute of Pharmacy, Posheri, Wada, Maharashtra, India

Abstract: *The cosmeceutical sector within the pharmaceutical industry is experiencing significant growth, as cosmetics become integral to our daily routines. These products cater to skin, hair, nails, and oral hygiene. Commonly utilized items include toothpaste, hair oils, and dyes. Nevertheless, numerous synthetic and chemical-laden cosmetics may result in adverse side effects, prompting a transition towards safer, natural, herbal, and organic alternatives that are more beneficial for the skin. Herbal products are recognized for their minimal or nonexistent side effects.*

Many people face hair-related challenges such as hair loss, dandruff, split ends, oily hair, thinning, and premature greying. This has sparked a heightened interest in remedies that foster healthy hair and promote growth. Hair serums are particularly effective in retaining moisture and ensuring a well-nourished, hydrated scalp.

Aloe vera gel is renowned for its soothing and hydrating properties, making it ideal for dry and irritated scalps. Vitamin E serves as a potent antioxidant that shields hair from damage and supports healthy growth. Rose water is beneficial for maintaining the scalp's pH balance and possesses anti-inflammatory characteristics. Sesame oil, rich in nutrients, nourishes the scalp and fortifies hair roots. Consequently, formulating a hair serum with these natural ingredients presents an excellent approach to addressing various hair concerns and enhancing overall hair care.

Keywords: Aloe barbadensis Miller, sesame oil, Rosa damascena

I. INTRODUCTION

Hair is an essential aspect of our appearance, significantly influencing our style and identity. It plays a crucial role in self-perception and is often associated with notions of beauty and self-assurance. Proper hair care is vital as it reflects one's health and self-respect. Hair is primarily composed of keratin, a protein, and consists largely of dead cells. Each strand originates from a follicle embedded in the skin, which serves as a specialized structure for hair production and growth. The visible portion of the hair is referred to as the hair shaft, which protrudes above the skin, while the root remains concealed within the follicle. Hair is distributed across various body regions, including the scalp, face, and other skin areas. The scalp, which covers the skull, is particularly significant for hair growth, comprising multiple layers of soft tissue and housing numerous hair follicles and sebaceous glands. The scalp maintains a pH level of approximately 5.5, whereas the hair shaft exhibits a more acidic pH of around 3.67. This acidic environment is essential for preserving the health of the hair cuticle and overall hair condition. Sebaceous glands secrete sebum, which contributes to the formation of an acid mantle on the scalp, providing a protective barrier against pathogens. Nonetheless, various factors such as environmental changes and bacterial imbalances can compromise this barrier, rendering the scalp susceptible to conditions like dandruff, fungal infections, scalp psoriasis, folliculitis, head lice, and hair loss.

II. LITERATURE REVIEW

1. Gayatri M. Penkar, Maithilee R. Salkar, Prachi S. Chavan, Maitrey S. Ambade

This study emphasizes the growing interest in herbal formulations due to the side effects associated with synthetic hair care products. It highlights the therapeutic roles of various herbal ingredients used in hair serum, such as Trigonella foenum-graecum (fenugreek) for hair growth, Citrus sinensis (orange peel) for antioxidant benefits, Linum usitatissimum (flaxseeds) for dandruff treatment, and Hibiscus rosa-sinensis for its coloring and nourishing properties.



Additionally, castor oil and vitamin E are recognized for their roles in moisturizing the scalp and preventing premature greying. The integration of these natural ingredients in hair serum formulations addresses common issues like hair fall, split ends, and scalp dryness effectively, offering a safer alternative to chemical products.

Citation: Penkar, G. M., Salkar, M. R., Chavan, P. S., Ambade, M. S., Parab, S. A., Sawant, M. M., & Japgag, V. A. (2023). Formulation and Evaluation of Herbal Hair Serum in Treatment of Various Hair- Related Problems. Research Journal of Pharmacognosy and Phytochemistry, 15(2), April–June. DOI: 10.52711/0975-4385.2023.00016

2. Ruchi Tiwari , Gaurav Tiwari1, Ajeet Yadav and Vadivelan Ramachandran

The study focuses on formulating a herbal hair serum using natural ingredients including Citrus sinensis (orange peel), Zingiber officinale (ginger), Linum usitatissimum (flaxseed), Nigella sativa (black seed), and Trigonella foenum-graecum (fenugreek), combined with castor oil and vitamin E. The aim was to address hair loss issues stemming from modern lifestyle factors. The serum was evaluated based on physical properties, pH, viscosity, homogeneity, eye sensitivity, hair growth efficacy, and microbial contamination. Results demonstrated that the serum had smooth texture, safe pH, and pseudoplastic behavior with minimal irritation and no microbial contamination over a seven-day stability test.

The research concluded that the herbal serum effectively promotes hair growth and improves hair quality, offering a natural alternative to chemical-based hair products with fewer side effects.

Citation: Tiwari, R., Tiwari, G., Yadav, A., & Ramachandran, V. (2021). Development and Evaluation of Herbal Hair Serum: A Traditional Way to Improve Hair Quality. The Open Dermatology Journal, 15, 52–58. <https://doi.org/10.2174/1874372202115010052>.

3. Rohan R. Vakhariya*, Srushti A. Oza, Chaitanya S. Bhingardev, Smita J. Patil, Sofiya F. Mujawar, Dr. S. K. Mohite

The research paper focuses on creating a daily-use herbal hair serum using natural ingredients like aloe vera, vitamin E, rose water, and almond oil. Three different formulations (H1, H2, H3) were prepared and evaluated for physical properties, pH, viscosity, spreadability, and stability. The study found all formulations to be stable, cosmetically acceptable, and effective in enhancing hair texture and overall quality, suggesting potential for safe and beneficial herbal cosmetic use.

Citation: Vakhariya, R. R., Oza, S. A., Bhingardev, C. S., Patil, S. J., Mujawar, S. F., & Mohite, S. K. (2022). Formulation, Development and Evaluation of Herbal Hair Serum: A Classical Approach to Enhance Hair Quality. International Journal of Pharmaceutical Sciences Review and Research, 76(2), 100-103. <https://doi.org/10.47583/ijpsrr.2022.v76i02.017>

4. MR. AJAY RAMKISAN MUNDHE

The study emphasizes the increasing preference for herbal products due to their safety and minimal side effects. The herbal serum was formulated using aloe vera gel, citric acid, liquid paraffin, and other ingredients, and was evaluated on parameters such as pH, viscosity, spreadability, and homogeneity. Among the three formulations (F1, F2, F3), F1 was found to be the most effective, showing favorable physical and functional properties. The results indicate that the herbal hair serum helps nourish the scalp, enhance hair growth, and manage hair health effectively.

Citation: Mundhe, A. R. (2023). Formulation and Evaluation of Herbal Hair Serum. International Journal of Creative Research Thoughts (IJCRT), 11(5), 958–975. ISSN: 2320-2882.

5. Mr Randad Shubham Shrinivas, Mr Hingane L.D

The research paper focuses on the formulation of a herbal hair serum using natural ingredients such as coconut oil, vegetable oils, argan oil, almond oil, lavender oil, lime essential oil, and triphala. The formulation aims to promote hair growth, control frizz, enhance smoothness and shine, and protect against damage. The study includes evaluations based on physical appearance, homogeneity, pH, viscosity, spreadability, and stability under different storage conditions. The



results support the effectiveness of the serum and highlight the benefits of herbal cosmetics as safe alternatives to chemical-based products.

Citation: Shrinivas, R. S., & Hingane, L. D. (2022). Preparation and Evaluation of Hair Serum. International Journal of Advances in Engineering and Management (IJAEM), 4(6), 2389–2393. <https://doi.org/10.35629/5252-040623892393>

6. Anusha R.*, Akhila N., Nikhitha J., Harish K., Abdull Rajjak Shaikh, Sony Y., Inamul

The study highlights the benefits of natural ingredients such as Zingiber officinale (ginger), Citrus sinensis (orange peel), Linum usitatissimum (flaxseed), Nigella sativa (black seed), Trigonella foenum-graecum (fenugreek), Cocos nucifera (coconut oil), Prunus dulcis (almond oil), and tocopherol (vitamin E). These ingredients offer antioxidant, anti-inflammatory, antimicrobial, moisturizing, and DHT-blocking properties that support scalp health and enhance hair quality. The paper reviews four formulations combining aqueous extracts and oils, followed by multiple evaluation techniques such as pH testing, viscosity, spreadability, stability, sterility, and hair growth activity in rabbits. The results indicated that the herbal serums were effective, non-irritating, and showed promising antibacterial and hair growth-promoting properties.

Citation: Anusha R., Akhila N., Nikhitha J., Harish K., Shaikh A.R., Sony Y., Inamul. (2023). Formulation and evaluation of herbal hair serum – a review. International Journal of Basic & Clinical Pharmacology, 12(5), 759–765. <https://dx.doi.org/10.18203/2319-2003.ijbcp20232578>

7. Vandana sahani, Shaili verma, Dr. Shivanand Patil.

The paper explores the formulation and benefits of a polyherbal hair serum composed of various medicinal plants like Aloe vera, Rosemary, Lavender, Amla, Hibiscus, Brahmi, and others. The study emphasizes the use of herbal ingredients due to their minimal side effects compared to synthetic products. The serum aims to address hair problems such as dandruff, hair fall, and scalp infections while promoting hair growth and follicle stimulation. The formulated serum was evaluated for parameters like pH, viscosity, spreadability, and homogeneity, meeting acceptable cosmetic standards. The research concludes that combining traditional herbal knowledge with modern cosmetic technology can result in effective and safe hair care solutions.

Citation: Sahani, V., Verma, S., & Patil, S. (2023). A Review on Poly Herbal Hair Serum. International Journal of Novel Research and Development, 8(4). Retrieved from <http://www.ijnrd.org/IJNRD2304202.pdf>.

Material

Aleovera

Botanical Name - Aloe barbadensis Miller

family -Liliaceae

synonyms -Aloe barbadensis, Aloe humilis Blanco, Aloe indica Royle, nomen nudum, Aloe perfoliata var.

Biological source Vera is a succulent plant whose dried juice is extracted from the fleshy leaves of various Aloe species. The most common for commercial use are Aloe barbadensis, Aloe ferox, and Aloe arborescens.

chemical constituent -polysaccharides, minerals, vitamins, enzymes, amino acids, sugars, and various phenolic compounds

uses-moisturizing, promoting growth, soothing the scalp, and reducing dandruff.





Vitamin E:

Synonyms: (+)-a-Tocopherol;

D-a-Tocopherol

Chemical Constituents: Composed of tocopherols and tocotrienols, which have neuroprotective properties.

Uses: Vitamin E is a source of supplements that improve hair growth by enhancing capillary circulation in the scalp, thereby increasing hair volume.

It is an essential micronutrient applied in various fields, including medicine, pharmaceuticals, cosmetics, and food. Furthermore, Vitamin E functions as an antioxidant, contributing to the prevention of premature hair graying.



Rose water-

Botanical Name-Rosa damascena

family- Rosaceae family

synomane attar of roses,eau de toilette,lavender water,scented liquid.

Biological source -Rose water is derived from the petals of various Rosa species, primarily Rosa damascena (Damask rose), through hydro-distillation with water. It contains a small percentage of rose oil and can also be made from other species like R. chinensis and R. rugosa.

chemical constituent- 2-phenylethanol, along with other volatile compounds like linalool, citronellol, and geraniol

uses-reducing frizz, moisturizing, and soothing the scalp. It can also help with dandruff, improve hair growth, and add shine. Rose water can be used as a hair rinse, mist, or added to conditioners.





Distilled water

Distilled water is purified water obtained through distillation and doesn't have a botanical name since it's not derived from plants. In pharmaceutical contexts, it's known as Aqua destillata or Aqua purificata.

Common Synonyms:

- Purified water
- Deionized water (slightly different)
- Sterile water (for medical use)

Chemical Constituents:

- Chemical formula: H_2O
- Ideally pure, but may contain trace dissolved gases and minimal ions if not properly handled.

Uses of Distilled Water:

1. ***Medical and Laboratory:***
 - Solvent for solutions
 - Used in sterilization processes
 - Rinsing lab equipment to prevent contamination
2. ***Pharmaceutical and Cosmetic:***
 - Ingredient in medicines and lotions
 - Used in injectable preparations (after sterilization)
3. ***Industrial:***
 - In car batteries and cooling systems
 - Prevents mineral buildup
4. ***Domestic:***
 - Used in steam irons and humidifiers
 - Ideal for CPAP machines
5. ***Botanical and Horticultural:***
 - Suitable for watering sensitive plants to avoid salt buildup.



Sesame oil

botanical name-Sesamum indicum L.

family -Pedaliaceae family

synonyms -teel oil, gingelly oil, benne oil, or til oil.

Biological source-Sesame oil is extracted from the seeds of the Sesamum indicum plant, a member of the Pedaliaceae family and a widely cultivated oilseed crop. It is obtained through pressing and refining processes.

chemical constituents-fatty acids, notably oleic and linoleic acids, along with lignans, phytosterols, and other bioactive compounds

uses-Promoting hair growth, preventing gray hair, protecting against UV damage, reducing hair fall, soothing dry hair, and treating dandruff.



Collection and authentication

Aleovera

Botanical Name - Aloe barbadensis Miller

family -Liliaceae

synonyms -Aloe barbadensis, Aloe humilis Blanco, Aloe indica Royle, nomen nudum, Aloe perfoliata var.

Biological source-Aloe vera is a succulent plant whose dried juice is extracted from the fleshy leaves of various Aloe species. The most common for commercial use are Aloe barbadensis, Aloe ferox, and Aloe arborescens.

chemical constituent -polysaccharides, minerals, vitamins, enzymes, amino acids, sugars, and various phenolic compounds

uses-moisturizing, promoting growth, soothing the scalp, and reducing dandruff.

1. Harvesting and Preparation

- Harvesting: Aloe vera leaves are harvested after 2-3 years of growth.

- Washing: Leaves are thoroughly washed to remove dirt.

- Draining : Leaves may stand upright for 10-15 minutes to let yellow latex (aloin) drain out, as it can irritate the skin.

2. Gel Extraction:

- Manual Extraction: The outer rind is peeled away to reveal the clear gel.

3. Purification and Stabilization:

- Filtration: The gel is filtered to remove impurities.

- Stabilization : Preservatives like vitamin C or sterilization techniques are used to extend shelf life.

Procedure for herbal hair serum preparation -

the preparation of 30ml of herbal hair serum is divided into three parts :-

Batch No 1

Procedure for Formulating Herbal Hair Serum:

1. Begin by cleaning all the glassware and drying them properly.

2. Measure 2.5 grams of aloe vera and transfer it into a beaker.

Copyright to IJARSCT
www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26874



657

3. Add 1 milliliter of vitamin E to the aloe vera.
4. Mix in 15 milliliters of rose water into the aloe vera and vitamin E mixture.
5. After stirring for a few minutes, heat the prepared solution for a short period.
6. Add 1 milliliter of sesame oil to the mixture.
7. Use a magnetic stirrer to thoroughly mix the preparation.
8. Transfer the mixture into a measuring cylinder and adjust the final volume to 30 milliliters.
9. Finally, transfer the completed solution into a container.

Sr.	Ingredients	Qt by (%)	Property
1	Aloe vera	2.5 gm	conditioners
2	Vitamin E	1 ml	For Hair growth
3	Rose water	15ml	Perfume
4	Sesame oil	1ml	nourishment
5	Distilled water	10.5 ml	Vehicle

Batch No 2

1. Clean and dry all glassware.
2. Measure 3g of aloe vera into a beaker.
3. Add 1ml of vitamin E and 17ml of rose water; mix well.
4. Heat the solution briefly.
5. Stir in 1ml of sesame oil.
6. Use a magnetic stirrer for thorough mixing.
7. Transfer to a measuring cylinder and make up to 30ml.
8. Finally, pour the serum into a container.

Sr.	Ingredients	Qt by (%)	Property
1	Aloe vera	3 gm	conditioner
2	Vitamin E	1ml	For Hair growth
3	Rose water	17ml	Perfume
4	Sesame oil	1ml	nourishment
5	Distilled water	8ml	Vehicle

Batch No 3

1. Clean and dry all glassware.
2. In a beaker, combine 3.5g aloe vera with 1ml vitamin E.
3. Mix in 19ml rose water, heat briefly, then add 1ml sesame oil.
4. Use a magnetic stirrer to mix thoroughly.
5. Adjust the final volume to 30ml in a measuring cylinder, then transfer to a container.

Sr. No	Ingredients	Qt by (%)	Property
1	Aloe vera	3.5 gm	Conditioner
2	vitamineE	1ml	For hair growth
3	Rose water	19ml	Perfume
4	Sesame oil	1ml	Nourishment
5	Distilled water	5.5 ml	Vehicle

Evaluation of Herbal Hair Serum:

1. **Physical Appearance:** Assess the appearance, color, and texture of the prepared herbal serum.
2. **Homogeneity Test:** Smear a clean, dried glass slide with the herbal serum and cover it with a glass cover. Evaluate the serum under light for homogeneity, aggregates, or floccules.



3. pH Measurement: Calibrate a digital pH meter using buffer solutions of pH 4 and pH 7. Immerse the electrode in the serum and record stable readings.

4. Viscosity Measurement: Use a Brookfield viscometer to determine the viscosity of the formulation.

Measure viscosity in a beaker with 100 ml of hair serum at 50 and 100

rpm using spindle numbers 63 and 64

5. Spreadability

Spreadability was measured using the parallel plate method, which assesses and quantifies the spreadability of the serum. A small amount of serum was placed between two horizontal plates measuring 20 x 20 cm. The diameter of the spread was measured after 1 minute.

Spreadability was calculated using the following formula:

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

Where:

S = spreadability

M = weight in the pan (attached to the upper slide)

L = length moved by the glass slide

T = time (in seconds) taken to separate the slides completely.

6. Stability

The prepared herbal hair serum was stored for one week at room temperature in a tightly sealed container. The pH and viscosity were measured after a week and compared with the original values.

7. Microbial Contamination

The Cup Plate and Pour Plate methods with nutrient agar to test for antimicrobial activity. Incubate samples for 24 hours at 37°C and measure zones of inhibition.

II. RESULTS AND DISCUSSION

1. Physical Appearance : The herbal hair serum was clear and free from foreign patches.



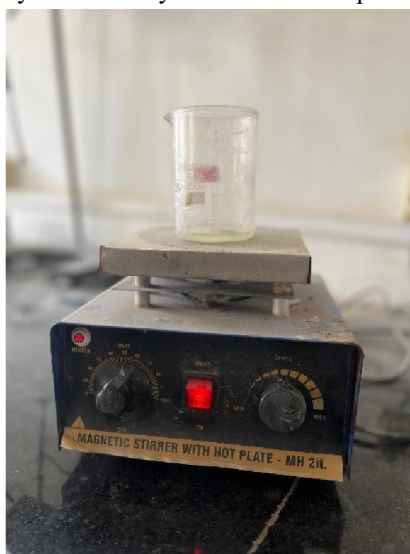
2. Unity No lumps or summations were observed, indicating good unity.

3. pH The serum's pH was measured at 4.50, suitable for the expression.





4. density density was assessed using a Brookfield viscometer with spindle No. 62 at different RPM settings(50 and 100).
5. Microbial Contamination Antimicrobial exertion showed a zone of inhibition of 1- 2 cm after three days.
6. Stability The expression displayed physical stability and harmonious pH throughout the study at room temperature.



III. CONCLUSION

Using a trial-and-error method, the herbal hair serum was successfully created and calculated, providing vital nutrients for strong hair and a healthy crown. Antioxidant properties found in its natural ingredients, such as vitamin E, rose water, and aloe vera, help prevent premature graying. Additionally, hair growth is encouraged by sesame oil painting oil. These elements, which are non-toxic in contrast to synthetic chemicals, are part of the reason for the increasing interest in the herbal industry and its bright future in cosmetics

Significance of Expected Outcomes of Herbal Hair Serum

The expected outcomes of herbal hair serum are significant because they:

1. Promote Hair Health: Nourishing and protecting hair, leading to improved texture and appearance.



2. Natural Solution: Offering a chemical-free alternative to traditional hair care products.
3. Scalp Benefits: Soothing and calming the scalp, reducing irritation and inflammation.
4. User Satisfaction: Potential for increased customer satisfaction and loyalty due to effective results.
5. Market Opportunity: Meeting growing demand for natural and organic hair care products.

Future Scope of Work on Herbal Hair Serum

The future scope of work on herbal hair serum includes:

1. Research and Development: Further studies on herbal ingredients and their benefits for hair health.
2. Product Innovation: Developing new formulations and products catering to specific hair types and needs.
3. Clinical Trials: Conducting clinical trials to validate efficacy and safety.
4. Market Expansion: Expanding market reach through online platforms, retail partnerships, and global distribution.
5. Sustainability: Focusing on eco-friendly packaging, sustainable sourcing, and environmentally responsible practices.
6. Customization: Offering personalized products based on individual hair types and needs

REFERENCES

- [1] Aruna V, Amruthavalli GV, Gayathri R. Hair root activation by anagen grow- a herbal hair growth serum. *Dermatol & Cosmet* 2019; 1(3): 56-9.
- [2] Begum R, Begum A. Preparation and evaluation of herbal hair oil. *Int J of Res and Anal Reviews* 2019; 6(1): 266-9.
- [3] Alfredo R, Lara P, Alessandra I, et al. Evaluation of a therapeutic alternative for telogen effluvium: A pilot study. *J Cosmetics Dermal Sci App* 2013; 3: 9-16.
- [4] Erukainure OL, Ebuehi OA, Iqbal Chaudhary M, et al. Orange peel extracts: Chemical characterization, antioxidant, antioxidative burst and phytotoxic activities. *J Diet Suppl* 2016; 13(5): 585-94.
[http://dx.doi.org/10.3109/19390211.2016.1150932] [PMID: 26930349]
- [5] Zhang Q. Development of citrus peel ethanolic extract shampoo. *IOP Conf Ser: Mater Sci Eng.* 1-6.
[http://dx.doi.org/10.1088/1757-899X/479/1/012014]
- [6] Goyal A, Sharma V, Upadhyay N, Gill S, Sihag M. Flax and flaxseed oil: An ancient medicine & modern functional food. *J Food Sci Technol* 2014; 51(9): 1633-53.
[http://dx.doi.org/10.1007/s13197-013-1247-9] [PMID: 25190822]
- [7] Halligudi N. Pharmacological properties of Flax seed: A Review. *Hygeia J D Med* 2012; 4(2): 70-7.
- [8] Manjula D, Josephine LJ, Kumari P, Banu S. Formulation and evaluation of flaxseed hair gel: A natural hair tamer. *Int J Res Pharm Chem* 2018; 8(3): 487-91.
- [9] Saleem U, Sabir S, Ahmad B. Protective role of Nigella sativa in chemotherapy induced alopecia. *Bangladesh J Pharmacol* 2017; 12:455-62. [http://dx.doi.org/10.3329/bjp.v12i4.33552]
- [10] Yousefi M, Barikbin B, Kamalinejad M, et al. Comparison of therapeutic effect of topical Nigella with Betamethasone and Eucerin in hand eczema. *J Eur Acad Dermatol Venereol* 2013; 27(12): 1498-504.
[http://dx.doi.org/10.1111/jdv.12033] [PMID: 23198836]
- [11] Ali BH, Blunden G. Pharmacological and toxicological properties of Nigella sativa. *Phytother Res* 2003; 17(4): 299-305. [http://dx.doi.org/10.1002/ptr.1309] [PMID: 12722128]
- [12] Majdalawieh AF, Fayyad MW, Nasrallah GK. Anti-cancer properties and mechanisms of action of thymoquinone, the major active ingredient of Nigella sativa. *Crit Rev Food Sci Nutr* 2017; 57(18): 3911-28.
[http://dx.doi.org/10.1080/10408398.2016.1277971] [PMID: 28140613]
- [13] Wijaya WH, Mun'im A, Djajadisastra J. Effectiveness test of fenugreek seed (trigonella foenum-graecum l.) Extract hair tonic in hair growth activity. *Int J Curr Res* 2013; 5(11): 3453-60.
- [14] Suryawanshi NC, Vijayendra Swamy SM, Nagoba Shivappa N, Wanje VV. Formulation and evaluation of herbal hair gel containing fenugreek seed extract for nourishment and hair growth. *Int J Sci Res Sci Technol* 2019; 6(4): 92-103.
- [15] Schulz C, Bielfeldt S, Reimann J. Fenugreek+micronutrients: Efficacy of a food supplement against hair loss. *Cosmetic Medicine* 2006.



- [16] Didarshetaban MB, Pour S, Reza H. Fenugreek (*Trigonella foenum-graecum* L.) as a valuable medicinal plant. *Int J Adv Biol Biomed Res* 2013; 1: 922-31.
- [17] Abbas AN. Ginger (*Zingiber officinale* (L.) Rosc) improves oxidative stress and trace elements status in patients with alopecia areata. *Niger J Clin Pract* 2020; 23(11): 1555-60.
[http://dx.doi.org/10.4103/njcp.njcp_59_19] [PMID: 33221781]
- [18] Mahboubi M. *Zingiber officinale* Rosc. Essential oil, a review on its composition and bioactivity. *Clin Phytosci* 2019; 5(6)
- [19] Shah RR, Mohite SA, Patel NR. Preparation and evaluation of polyherbal hair oil- an effective cosmetic. *Asian J Pharm Res* 2018; 8(1): 36-8.
[<http://dx.doi.org/10.5958/2231-5691.2018.00007.2>]
- [20] Gautam S, Dwivedi S, Dubey K, Joshi H. Formulation and evaluation of herbal hair oil. *Int J Chem Sci* 2012; 10(1): 349-53.
- [21] Beroual K, Maameri Z, Halmi S, Benleksira B, Agabou A, Hamdi PY. Effects of *Linum usitatissimum* L. ingestion and oil topical application on hair growth in rabbit. *Int J Med Arom Plants* 2013; 3(4): 459-63.
- [22] Reddy TUK, Sindhu G, Rajesh S, Aruna B, Rani KSS. Preparation and evaluation of herbal hair oil. *Indo Am. j. pharm. Sci* 2017; 4(06): 1540-6.
- [23] Sumangala BK, Kalpana P, Aishwarya T, Krithika G. Evaluation of herbal formulations on fungal pathogens of plants: A case study. *Acta Scientific Agriculture* 2019; 3: 122-4.
[<http://dx.doi.org/10.31080/ASAG.2019.03.0734>]
- [24] Viswanad V, Aleykutty NA, Jayakar B, Zacharia SM, Thomas L. Development and evaluation of antimicrobial herbal formulations containing the methanolic extract of *Samadera indica* for skin diseases. *J Adv Pharm Technol Res* 2012; 3(2): 106-11.
[<http://dx.doi.org/10.4103/2231-4040.97285>] [PMID: 22837958]

