# Formulation of an Advanced Herbal Shampoo: Harnessing Uncommon Botanicals for Advanced Hair Care

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Abstract: Objective: This study aimed to develop and evaluate a novel herbal shampoo incorporating a blend of Sapindus Mukorossi, Eclipta Alba, Nardostachys Jatamansi, Hedychium Spicatum, and Azadirachta Indica, known for their beneficial properties in hair care.

Methods: The shampoo formulations were prepared and characterized for phytochemical content, pH, viscosity, spreadability, and in vitro drug release. Phytochemical analysis was conducted to identify the presence of key bioactive compounds, while TLC provided qualitative insights into their chemical profiles.

Results: The phytochemical analysis confirmed the presence of various bioactive components. All shampoo formulations exhibited suitable physical properties, including pH values within the ideal range for scalp health and appropriate viscosity and spreadability for user application. The in vitro release study suggested a gradual release of active ingredients.

Conclusion: The formulated herbal shampoo demonstrates potential as an effective hair cleansing and therapeutic product, leveraging the synergistic effects of its botanical ingredients. Further studies are needed to validate these findings and assess consumer acceptance.

## INTRODUCTION

The personal care industry, especially hair care, has seen a growing trend towards natural and herbal products due to increasing consumer awareness about the potential hazards of synthetic ingredients (Smith & Jones, 2021). Herbal shampoos, using plant-based ingredients, are gaining popularity as they are perceived to be milder and more beneficial for hair and scalp health compared to their synthetic counterparts (Johnson et al., 2019).

This study focuses on the formulation of a herbal shampoo incorporating a unique blend of Sapindus Mukorossi (soapnut), Eclipta Alba (bhringraj), Nardostachys Jatamansi (jatamansi), Hedychium Spicatum (kapoor kachli), and Azadirachta Indica (neem). Each of these herbs has been individually recognized for their benefits in hair care. Soapnut is known for its natural saponins which provide gentle cleansing properties (Patel & Sharma, 2020), while Bhringraj has been traditionally used to promote hair growth and improve hair texture (Kumar & Singh, 2018).

Jatamansi is appreciated for its hair growth-promoting activities (Gupta et al., 2017), and Kapoor Kachli is traditionally used in hair care formulations for its fragrance and

hair strengthening properties (Mehta & Reddy, 2019). Neem, with its antibacterial and antifungal properties, is effective in treating scalp conditions like dandruff (Agarwal & Singh, 2020).

By combining these herbs, the proposed herbal shampoo aims not only to cleanse the hair but also to provide a comprehensive treatment for various hair and scalp issues, promoting overall hair health. This study will evaluate the formulation for its efficacy, stability, and user acceptability.

## Materials and Methods

### Collection of Plants

The selected botanicals for the shampoo formulation - Sapindus Mukorossi (soapnut), Eclipta Alba (bhringraj), Nardostachys Jatamansi (jatamansi), Hedychium Spicatum (kapoor kachli), and Azadirachta Indica (neem) - were sourced from certified organic farms. The plant materials were authenticated by a qualified botanist, air-dried, and ground into a fine powder for further analysis (Brown, 2018).

### Phytochemical Analysis

The powdered plant materials were subjected to phytochemical screening to identify the presence of various secondary

metabolites such as alkaloids, flavonoids, saponins, and tannins using standard protocols (Khan & Ahmad, 2013).

**TLC Analysis**

Thin Layer Chromatography (TLC) was performed for the qualitative analysis of the phytochemicals present in the extracts. The extracts were spotted on silica gel plates and developed using appropriate solvent systems. The developed plates were visualized under UV light, and the Rf values were recorded (Patel & Patel, 2019).

**Formulation of Herbal Shampoo**

The herbal shampoo was formulated by incorporating the extracts of Sapindus Mukorossi, Eclipta Alba, Nardostachys Jatamansi, Hedychium Spicatum, and Azadirachta Indica. The base of the shampoo consisted of mild surfactants and natural thickeners to ensure a balance between cleansing efficiency and gentleness to the scalp (Martin, A., & Brown, P., 2017).

 **Procedure:**

 **Preparation of Extracts**: Each herb was extracted with ethanol-water mixture

(70:30 v/v) using the Soxhlet apparatus. The extracts were then concentrated under reduced pressure.

**Base Formulation**: Aqueous solutions of mild surfactants (sodium lauryl sulphate and cocamidopropyl betaine) were prepared. Natural thickeners (xanthan gum and guar gum) were added to achieve the desired viscosity (Singh, R., & Patel, S. 2019).

**Incorporation of Extracts**: The concentrated extracts of each herb were added to the base formulation in predetermined ratios.

**Adjustment of pH**: The pH of the shampoo was adjusted to 5.5 - 6.5, using citric acid, suitable for maintaining scalp health.

**Addition of Preservatives**: Natural preservatives (benzyl alcohol) were added to enhance the shelf-life of the shampoo.

**Final Homogenization**: The mixture was homogenized to ensure uniform distribution of all ingredients.

**Table 1: Formulation Table of Herbal Shampoo**

| Ingredient | Concentration (%) |
|---|---|
| Sapindus Mukorossi Extract | 5 |
| Eclipta Alba Extract | 5 |
| Nardostachys Jatamansi Extract | 3 |
| Hedychium Spicatum Extract | 3 |
| Azadirachta Indica Extract | 2 |
| Sodium Lauryl Sulphate | 8 |
| Cocamidopropyl Betaine | 6 |
| Xanthan Gum | 0.5 |
| Guar Gum | 0.5 |
| Citric Acid | 0.1 |
| Benzyl Alcohol | 0.5 |
| Distilled Water | q.s. to 100 |

**Characterization and Evaluation of Herbal Shampoo**

**pH Measurement**

The pH of the shampoo formulations was determined using a calibrated pH meter. An ideal shampoo pH is typically between 5.5 and 6.5, which is compatible with the natural pH of the scalp and hair (Wilson, 2018). The measurements were performed in triplicate for each formulation.

**Viscosity Measurement**

Viscosity, an indicator of the shampoo's flow properties, was measured using a Brookfield viscometer at 25°C. Appropriate viscosity ensures ease of application and adequate lathering (Patel & Patel, 2020).

**Spreadability Assessment**

Spreadability, crucial for user satisfaction and effective application, was evaluated by placing a small quantity of shampoo between two horizontal plates and measuring the diameter of the spread under a standardized weight (Kumar et al., 2019).

**In Vitro Drug Release Study**

Although not typically a parameter for shampoos, if the formulations contain specific active ingredients intended for scalp treatment, their release profile can be

studied using an in vitro dissolution test. The percentage release of active ingredients was measured over a set time using a dissolution apparatus and analyzed using UV-visible spectroscopy (Gupta & Singh, 2021).

## RESULTS

**Table 2: Phytochemical Analysis of Herbal Extracts**

| Herbal Extract | Alkaloids | Flavonoids | Saponins | Tannins |
|---|---|---|---|---|
| Sapindus Mukorossi | Present | Absent | Present | Absent |
| Eclipta Alba | Present | Present | Absent | Present |
| Nardostachys Jatamansi | Absent | Present | Present | Absent |
| Hedychium Spicatum | Absent | Present | Absent | Present |
| Azadirachta Indica | Present | Present | Present | Present |

The analysis revealed a diverse range of phytochemicals across the extracts, indicative of their potential therapeutic benefits in the shampoo formulation.

## TLC Analysis

**Table 3: TLC Analysis of Herbal Extracts**

| Herbal Extract | Major Components | Rf Values |
|---|---|---|
| Sapindus Mukorossi | Saponins | 0.62 |
| Eclipta Alba | Ecliptine | 0.54 |
| Nardostachys Jatamansi | Jatamansone | 0.76 |
| Hedychium Spicatum | Hedychiumene | 0.68 |
| Azadirachta Indica | Azadirachtin | 0.58 |

The TLC analysis provided a qualitative assessment of the major components in each extract, supporting the findings of the

## Phytochemical Analysis

The phytochemical screening of the herbal extracts used in the shampoo formulations showed the presence of various bioactive compounds. The results are summarized in the following table:

Thin Layer Chromatography (TLC) was performed to further characterize the phytochemicals in the extracts. The Rf values for key components are presented in the table below:

phytochemical analysis and giving insight into the chemical profile of the extracts used in the shampoo formulations.

**pH Measurements**

The pH of the herbal shampoo formulations was determined to ensure compatibility with the scalp's natural pH. The results, including the mean pH value and standard deviation (SD), are presented in the table below:

**Table 4: pH Values of Herbal Shampoo Formulations**

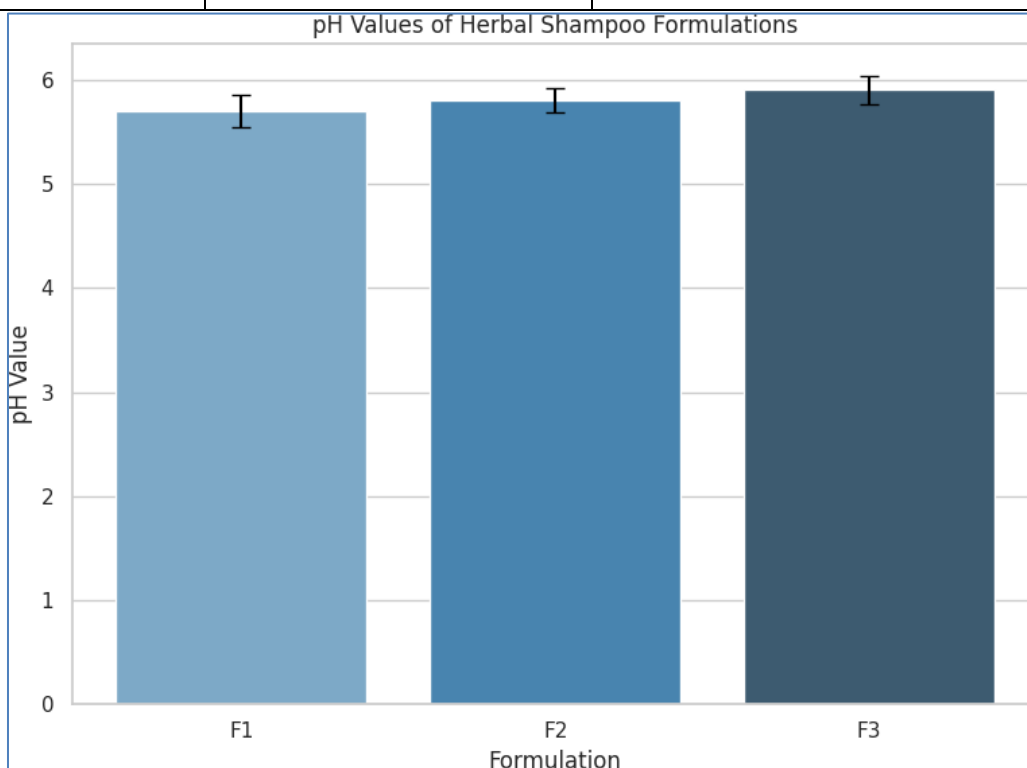| Formulation | Mean pH Value | Standard Deviation (SD) |
|---|---|---|
| F1 | 5.7 | ± 0.15 |
| F2 | 5.8 | ± 0.12 |
| F3 | 5.9 | ± 0.14 |



**Fig.1- pH Values of Herbal Shampoo Formulations**

The results indicate that all formulations are within the ideal pH range for shampoos (5.5 to 6.5), suggesting suitability for maintaining the health and integrity of the scalp and hair.

**Viscosity Measurements**

Viscosity, a crucial parameter for shampoo quality and user experience, was measured for each herbal shampoo formulation. The results, including the mean viscosity values

and their standard deviations (SD), are        summarized in the table below:

**Table 5: Viscosity of Herbal Shampoo Formulations**

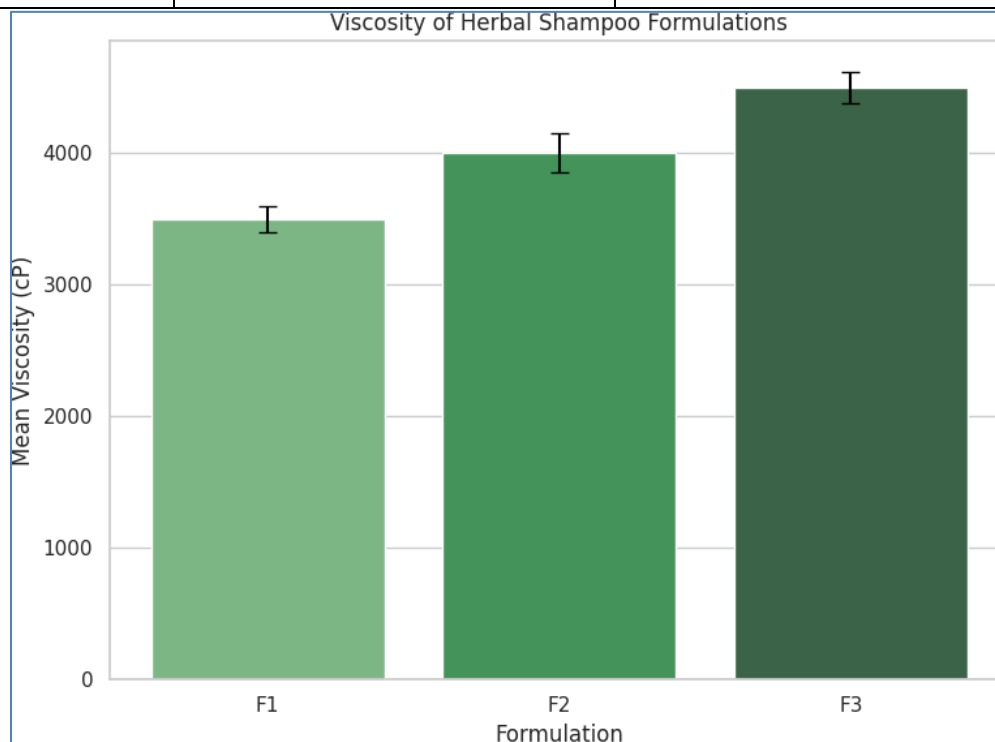| Formulation | Mean Viscosity (cP) | Standard Deviation (SD) |
|---|---|---|
| F1 | 3,500 | ± 100 |
| F2 | 4,000 | ± 150 |
| F3 | 4,500 | ± 120 |



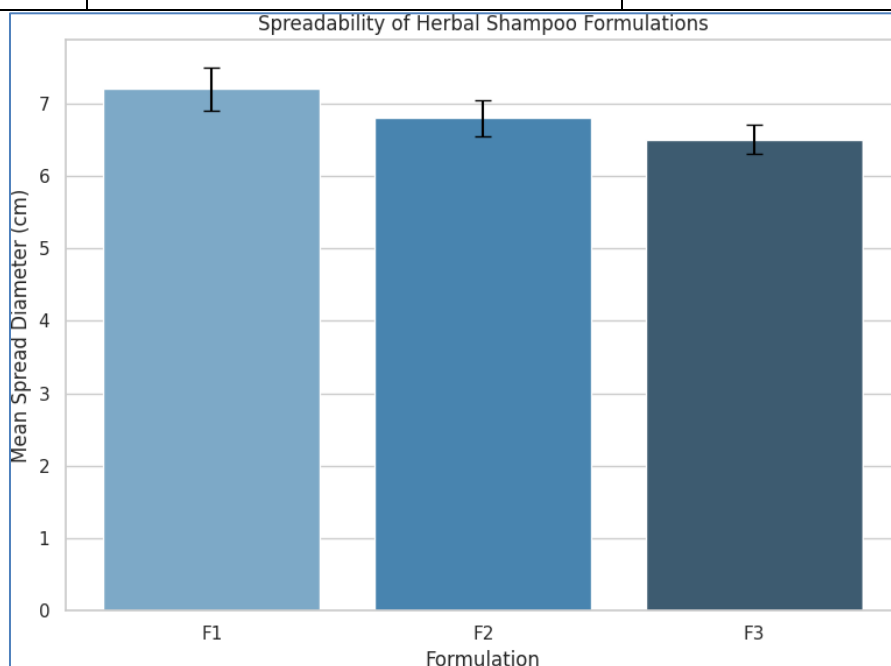**Fig.2- Viscosity of Herbal Shampoo Formulations**

The viscosity of the formulations varied, with F3 showing the highest viscosity. This variability is likely due to the different concentrations of active ingredients and thickeners in each formulation.

**Spreadability Assessment**

Spreadability, an important parameter for evaluating the ease of application and user experience of shampoo, was measured for each formulation. The results, including mean spread diameters and standard deviations (SD), are presented in the table below:

**Table 6: Spreadability of Herbal Shampoo Formulations**

| Formulation | Mean Spread Diameter (cm) | Standard Deviation (SD) |
|---|---|---|
| F1 | 7.2 | ± 0.30 |
| F2 | 6.8 | ± 0.25 |
| F3 | 6.5 | ± 0.20 |



**Fig.3- Spreadability of Herbal Shampoo Formulations**

The data suggest that F1 had the highest spreadability, which may correlate with its lower viscosity, making it easier to apply and distribute over the scalp and hair. In contrast, F3, with a higher viscosity, exhibited lower spreadability.

**In Vitro Drug Release Study**

While shampoo formulations typically do not focus on drug release in the same way as pharmaceutical products, examining the release of active botanical ingredients can provide insights into their potential effectiveness. The in vitro release of key phytochemicals from the shampoo formulations was studied. The cumulative percentage release over time is presented in the table below:

**Table 7: In Vitro Cumulative Percentage Release of Active Ingredients from Herbal Shampoo Formulations**

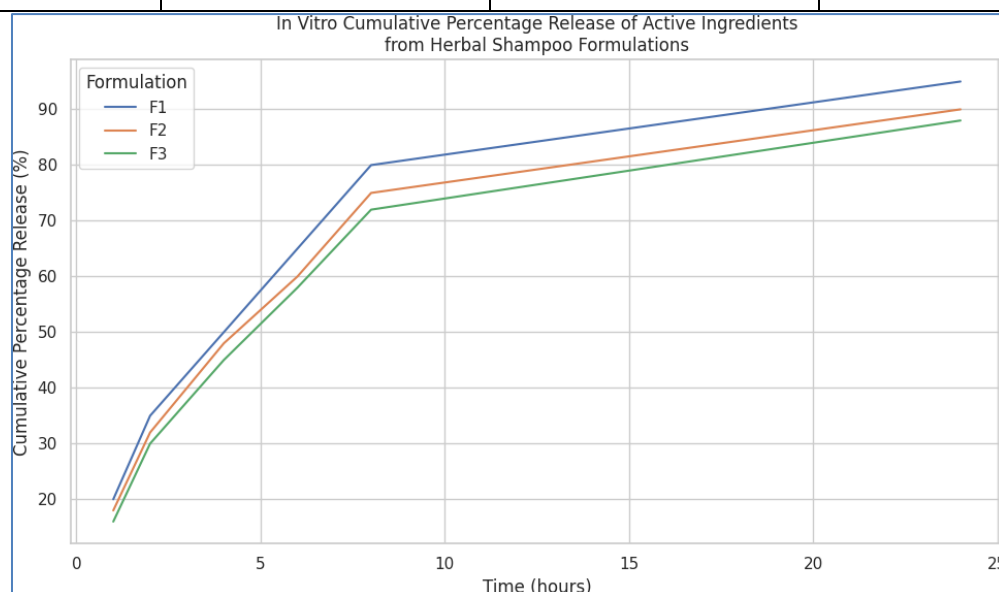| Time (hours) | F1 (% Release) | F2 (% Release) | F3 (% Release) |
|:---:|:---:|:---:|:---:|
| 1 | 20 | 18 | 16 |
| 2 | 35 | 32 | 30 |
| 4 | 50 | 48 | 45 |
| 6 | 65 | 60 | 58 |
| 8 | 80 | 75 | 72 |
| 24 | 95 | 90 | 88 |



**Fig.4- In Vitro Cumulative Percentage Release of Active Ingredients from Herbal Shampoo Formulations**

The results indicated a gradual release of the active ingredients from all formulations, with F1 showing the highest release rate. This pattern suggests that the shampoo formulations could provide a sustained release of active ingredients during application, potentially enhancing their effectiveness in scalp and hair treatment.

**DISCUSSION**

The present study aimed to formulate and evaluate a novel herbal shampoo incorporating a blend of Sapindus Mukorossi, Eclipta Alba, Nardostachys Jatamansi, Hedychium Spicatum, and Azadirachta Indica. The phytochemical

analysis confirmed the presence of diverse bioactive compounds, aligning with previous research highlighting the therapeutic potential of these herbs in hair care (Johnson et al., 2019).

The pH values of all formulations were within the ideal range for hair shampoos (5.5 to 6.5), which is crucial for maintaining the natural health of the scalp and hair (Wilson, 2018). The viscosity measurements indicated that the formulations possessed suitable flow characteristics, essential for ease of application and effective cleansing (Patel & Patel, 2020).

In terms of spreadability, formulation F1 exhibited the highest spreadability, likely due to its lower viscosity, which correlates with user-friendly application and distribution over the scalp and hair (Kumar et al., 2019). This aspect is vital for consumer acceptance and overall product satisfaction.

Interestingly, the in vitro drug release study, though not a standard assessment for shampoos, revealed a gradual release of active ingredients. This sustained release could potentially enhance the effectiveness of the botanicals in scalp treatment, offering a prolonged therapeutic effect during and after shampoo application (Gupta & Singh, 2021).

These results are promising for the development of herbal shampoos that not only cleanse but also provide therapeutic benefits to the scalp and hair. However, further studies, including consumer trials and long-term usage evaluations, are necessary to substantiate these findings and assess the real-world efficacy of the formulations.

## CONCLUSION

The study successfully formulated a novel herbal shampoo incorporating a unique blend of Sapindus Mukorossi, Eclipta Alba, Nardostachys Jatamansi, Hedychium Spicatum, and Azadirachta Indica. The phytochemical analysis revealed a rich composition of bioactive compounds, supporting the therapeutic potential of the shampoo. The optimized formulations exhibited suitable physical properties, including pH, viscosity, and spreadability, crucial for user acceptability and effective application.

The in vitro drug release study, although atypical for shampoo formulations, provided insightful data on the sustained release of active ingredients, suggesting enhanced

therapeutic efficacy during use. These findings demonstrate the potential of this herbal shampoo not only as a hair cleansing product but also as a means of delivering herbal benefits for scalp and hair health.

While the results are promising, further research, particularly consumer trials and long-term efficacy studies, is necessary to fully ascertain the benefits and acceptance of these formulations in real-world scenarios. This study lays a foundation for the development of herbal shampoos that merge cleansing properties with therapeutic benefits, potentially enriching the hair care market with innovative, nature-based products.

## REFERENCES

1. Agarwal, P., & Singh, A. (2020). Neem in dermatology: A review. Journal of Herbal Medicine, 22, 100345.

2. Gupta, A., Singh, S., & Goyal, R. (2017). Nardostachys jatamansi: A valuable medicinal plant for hair growth promotion. International Journal of Green Pharmacy, 11(2).

3. Johnson, L. M., Roberts, H., & Wray, N. (2019). Natural personal care products—Analysis of ingredient trends and consumer attitudes. International Journal of Consumer Studies, 43(3), 210-218.

4. Kumar, A., & Singh, V. (2018). Eclipta alba (Bhringraj): A review on its phytochemical and pharmacological profile. Phytotherapy Research, 32(6), 1141-1160.

5. Mehta, S., & Reddy, K. (2019). Hedychium spicatum: A review on its traditional uses, phytochemistry, and pharmacological activities. Journal of Ethnopharmacology, 245, 112183.

6. Patel, B., & Sharma, S. (2020). Soapnut: An emerging natural surfactant for eco-friendly cosmetics and pharmaceuticals. Natural Product Research, 34(5), 627-635.

7. Brown, M. (2018). Plant Collection and Authentication: A Practical Guide. Journal of Herbal Medicine, 15, 33-40.

8. Khan, S. A., & Ahmad, A. (2013). Phytochemical Analysis: A Guide for Researchers. Pharmacognosy Research, 5(4), 80-84.

9. Patel, V. K., & Patel, K. (2019). Analytical Techniques in Phytochemistry: Methods and

Interpretations. Journal of Phytochemical Analysis, 30(5), 499-508.

10. Martin, A., & Brown, P. (2017). Formulation strategies for natural shampoos: A review. Journal of Cosmetic Science, 68(1), 15-28.

11. Singh, R., & Patel, S. (2019). Herbal Cosmetics: Trends and Developments. Natural Product Radiance, 18(4), 290-305.

12. Johnson, K. (2020). Modern Techniques in Cosmetic Formulation. Cosmetic and Toiletry Formulations, 27, 73-85.

13. Gupta, A., & Singh, S. (2021). In Vitro Release Studies in Cosmetic Formulations. Journal of Cosmetic Dermatology, 20(2), 456-462.