

B. Pharmacy
Semester- VIII



ABSTRACT BOOK

**PROJECT WORK REPORTS (BP813PW) &
RELATED PUBLICATIONS**



2025-26

Compiled and Published By

**Research & Development (R&D) Cell and Internal Quality
Assurance Cell (IQAC)**

P.R. PATIL INSTITUTE OF PHARMACY

Talegaon (S.P.), Wardha, Maharashtra- 442 202

DECLARATION

This is to declare and certify that, the abstracts compiled in this book are based on the reports of the Project Work (BP813PW) submitted by the students of B. Pharm. 8th semester of the P.R. Patil Institute of Pharmacy, Talegaon (S.P.), Dist-Wardha as a part of the academic curriculum during the Academic Year 2025-26.

It is further certified that the published research papers included in this abstract book are outcomes derived from the Project Work carried out by the students during the Academic Year 2025-26 under the guidance of faculty members. These publications are included solely to highlight the academic and research contributions emerging from the Project Work.

The contents of this Project Work Reports and Related Publications are intended strictly for academic, educational and reference purposes only. The material shall not be used for any commercial purpose without prior written permission from the concerned authors and the Institute.

The compilation has been carried out with due care to maintain academic integrity and authenticity of the submitted work. Responsibility for the originality and accuracy of individual abstracts and publications rests with the respective authors.

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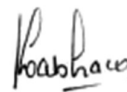


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FOREWORD

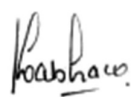
It gives me immense pleasure to present this abstract book of 'Project Work Reports and Related Publications' for the Academic Year 2025–26. The Project Work is a vital component of the Bachelor of Pharmacy curriculum, providing students with an opportunity to undertake independent research under the guidance of experienced faculty members. It serves as a platform to integrate the knowledge and skills acquired throughout the academic program while fostering scientific inquiry, critical thinking, and innovation.

Through this project, students gain hands-on experience in research methodology, experimental design, data analysis and scientific documentation. The abstracts compiled in this book showcase the diverse research topics undertaken by our students, reflecting their commitment to addressing contemporary challenges in pharmaceutical sciences through systematic investigation and evidence-based approaches.

A significant highlight of this compilation is the inclusion of research publications arising from the Project Work, demonstrating the scientific quality, originality and research potential of our students. These achievements are a testament to the dedicated guidance provided by our faculty mentors and the research-oriented environment nurtured at the Institute. We are confident that this initiative will continue to inspire students to pursue excellence in research, contribute to scientific advancement, and uphold the highest standards of professional and ethical practice.

I sincerely appreciate the efforts of the students, faculty guides, and the Project Work Coordination Team, as well as the Research & Development (R&D) Cell and Internal Quality Assurance Cell (IQAC) for their dedicated contribution in compiling and presenting this academic document.

I am confident that this abstract book will serve as a valuable academic resource and a source of inspiration for students, faculty members, and stakeholders, encouraging continuous improvement and excellence in professional education.



Principal

Name: Dr. Koshish B. Gabhane
P.R. Patil Institute of Pharmacy,
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Abstracts Included in the Submitted Project Work Report

S. No.	Abstract Title and Students	Page No.
1.	Development of cosmeceutical for vascular periorbital hyperpigmentation (POH) <i>A. Zade, A. Nandagawali, A. Kokate and A. Bure</i> (Supervisor- Dr. Koshish B. Gabhane)	1
2.	Formulation and evaluation of mosquito repellent cream <i>D. Rathod, F. Pote, G. Dukare and H. Pandey</i> (Supervisor- Dr. Chetan V. Ghulaxe)	2
3.	Formulation and evaluation of cream for hypopigmentation <i>H. Firdaus, J. Watsar, K. Mekalwar and K. Jepulkar</i> (Supervisor- Ms. Bhagyashri S. Patil)	3
4.	Formulation and evaluation of herbal shampoo <i>A. Sabane, B. Gandhre, B. Kolse and D. Ramdhan</i> (Supervisor- Dr. Nilesh B. Banarase)	4
5.	Formulation and evaluation of anti-lice roll on serum <i>K. Meshram, K. Burange, L. Wange and L. Fating</i> (Supervisor- Mr. Krunal Takarkhede)	5
6.	Emulgel for skin soothing application <i>P. Barange, P. Khante, R. Lokhande, R. Shelke and R. Bhojane</i> (Supervisor- Ms. Samruddhi Khonde)	6
7.	Formulation and evaluation of herbal deodorant using plant extract <i>S. Mahure, S. Sable, S. Gawai, S. Doye and S. Raut</i> (Supervisor- Ms. Vaishnavi N. Ghati)	7
8.	Formulation and evaluation of herbal lip tint using <i>Beta vulgaris</i> extract <i>P. Ikhar, P. Gawande, P. Darange and P.D. Thakre</i> (Supervisor- Mr. Vaibhav D. Dapurkar)	8
9.	Formulation and evaluation of herbal hair dye gel <i>P. Ingale, P. Bargat, P. Bhonde, P. Jadhav and P. Mahajan</i> (Supervisor- Mrs. Farah M. Khan)	9
10.	Formulation and evaluation of syndet based baby soap <i>L. Ingole, L. Aglawe, M. Rithe and M. Niwal</i> (Supervisor- Mr. Mahesh Gadge)	10
11.	Formulation and evaluation of multipurpose herbal foot cream <i>R. Surjuse, S. Kardikar, S. Charpe, S. Metkar and S. Mamurkar</i> (Supervisor- Mr. Mohit A. Raut)	11
12.	Formulation and evaluation of herbal face sheet mask <i>A. Sirsat, A. Dukare, A. Watane and A. Mhaisgawli</i> (Supervisor- Dr. Vikrant L. Salode)	12
13.	Formulation and evaluation of herbal hair mask <i>S. Bhunte, S. Salunke, S. Shaha, S. Yawale and S. Raut</i> (Supervisor- Ms. Trusha R. Gurnule)	13
14.	Phytochemical based soap: Formulation and evaluation study <i>S. Pokale, S. Adokar, S. Wakilahmad, S. Kadu and S. Inkane</i> (Supervisor- Mrs. Tejaswini G. Malge)	14

Published Scientific Papers Based on the Project Work Report

S. No.	Paper Title	Journal Name	Volume, Issue, Page No and Year
1.	Formulation and evaluation of herbal mosquito repellent cream	International Journal of Pharmacognosy	13(5): 503-511, 2026
2.	Formulation development and evaluation of cosmetic emulgel for skin soothing application	European Journal of Pharmaceutical and Medical Research	13(6): 529-536, 2026
3.	Formulation and evaluation of herbal face sheet mask	European Journal of Pharmaceutical and Medical Research	13(5): 780-788, 2026
4.	Herbal Shampoo: Formulation and Evaluation Study	International Journal of Pharmaceutical research and Applications	11(3): 520-526, 2026
5.	Formulation and evaluation of herbal scrub	European Journal of Pharmaceutical and Medical Research	13(6): XX-XX, 2026
6.	Formulation and evaluation of anti-lice roll on serum	International Journal of Medical and Pharmaceutical Sciences	2(5): 409-416, 2026
7.	Formulation and evaluation of herbal deodorant using plant extract	International Journal of Medical and Pharmaceutical Sciences	2(5): 667-676, 2026
8.	Formulation and evaluation of herbal lip tint using Beta vulgaris extract	International Journal of Pharmaceutical Sciences	4(5): 5034-5048, 2026
9.	Formulation and evaluation of multipurpose herbal based foot cream	International Journal of Pharmaceutical Sciences	4(5): 771-778, 2026
10.	Formulation and evaluation of herbal hair mask	International Journal of Pharmaceutical Sciences	4(6): 181-193, 2026

11.	Formulation and evaluation of cream for hypopigmentation	European Journal of Pharmaceutical and Medical Research	13(5): 424-432, 2026
12.	Formulation and evaluation of herbal hair dye gel	European Journal of Pharmaceutical and Medical Research	13(5): 672-680, 2026
13.	Phytochemical based soap: Formulation and evaluation study	World Journal of Pharmacy and Pharmaceutical Sciences	15(2): 2139-2149, 2026
14.	Formulation and evaluation of syndet based baby soap	World Journal of Pharmacy and Pharmaceutical Research	3(5): 195-212, 2026

Abstracts Included in the Submitted Project Work Report

Abstract-1

Development of cosmeceutical for vascular periorbital hyperpigmentation (POH)

A. Zade, A. Nandagawali, A. Kokate and A. Bure

Supervisor- Dr. Koshish B. Gabhane

Abstract:

The present study focuses on the development and evaluation of a cosmeceutical for the treatment of vascular periorbital hyperpigmentation (POH) using caffeine as the active ingredient. The aim of the study was to formulate a safe, effective, and economical serum capable of improving microcirculation and reducing vascular hyperpigmentation around the periorbital area. The serum was prepared using suitable base formulations and nano emulsion techniques to enhance the effectiveness of the active ingredients. Base formulations and nano emulsions were developed and compared for their physicochemical and stability characteristics. The prepared formulation was evaluated for various parameters including viscosity, pH, colour, odour, and skin irritation by patch test method. The results indicated that the formulation was stable, smooth in texture, non-irritant, and suitable for topical application. The presence of caffeine and other ingredients contributed to improved microcirculation and showed promising potential in the treatment of vascular periorbital hyperpigmentation. Thus, the developed cosmeceutical serum can be considered a promising alternative for the management of vascular POH.

Keywords: Cosmeceutical serum, vascular periorbital hyperpigmentation, caffeine, Nano-emulsion, microcirculation, Skin irritation test.

Abstract-2

Formulation and evaluation of mosquito repellent cream

D. Rathod, F. Pote, G. Dukare and H. Pandey

Supervisor- Dr. Chetan V. Ghulaxe

Abstract:

Herbal mosquito repellents are natural products designed to repel mosquitoes and other biting Insects. They are made from plant-based ingredients, including essential oils, herbs, and other botanical extracts. Mosquito-borne diseases, including malaria, dengue, and Zika, constitute a formidable global health challenge, resulting in approximately 750,000 fatalities annually. This study aims to address this issue by formulating a plant-based mosquito repellent that prioritizes human safety and environmental sustainability. Citronella oil, thuja oil, lemongrass oil, rosemary oil renowned for its distinctive aroma, owes its insect-repellent properties to a combination of key constituents, including citronellal, eugenol, geraniol, and limonene. We used steam distillation and Clavengers apparatus for the extraction of oils. Three formulations, F1, F5 and F6, were developed with varying concentrations of these oils along with other excipients such as Bees wax, Glycerine, Cetyl alcohol, and Distilled water. The preparation involved separate heating and mixing of oil and water phases, followed by their combination to form a consistent cream. The study highlights the potential of natural oils in creating effective and skin-friendly mosquito repellent products. The prepared cream was evaluated for physicochemical parameters, stability, skin irritation, and mosquito repellent activity. The formulation showed good spreadability, skin compatibility, and effective mosquito repellency for up to 3–4 hours.

Keywords: Repellent activity, *cymbopogon nardus*, spreadability, lemongrass oil, skin friendly.

Abstract-3

Formulation and evaluation of cream for hypopigmentation

H. Firdaus, J. Watsar, K. Mekalwar and K. Jepulkar

Supervisor- Ms. Bhagyashri S. Patil

Abstract:

Skin pigmentation is a fundamental biological process that contributes to the color and protective function of the skin in humans and other animals. It is primarily governed by melanogenesis, a process in which melanocytes synthesize melanin. Any disruption in this pathway can result in various pigmentary disorders such as hypopigmentation, leukoderma, and vitiligo. Hypopigmentation is characterized by a decrease or absence of melanin production, leading to the appearance of lighter or white patches on the skin. This condition may be caused by genetic predisposition, autoimmune responses, infections, physical injury, or chemical exposure. Common conditions associated with hypopigmentation include vitiligo and post-inflammatory hypopigmentation. Although conventional treatments like corticosteroids, calcineurin inhibitors, and psoralen-based therapies are widely used, their long-term application may lead to adverse effects such as skin irritation, redness, thinning, and increased sensitivity to light. In this context, the present study aims to develop and evaluate an herbal cream for the management of hypopigmentation. The formulation incorporates natural ingredients such as Bakuchi oil, turmeric extract, neem extract, and aloe vera in an appropriate cream base. The prepared formulation was assessed for various physicochemical parameters including pH, viscosity, spreadability, homogeneity, stability, and overall appearance. These herbal components are recognized for their ability to stimulate melanocyte function, along with providing antioxidant and anti-inflammatory effects. The results suggest that the developed herbal cream may serve as a safe, effective, and cost-efficient alternative to conventional synthetic therapies. It also demonstrates better patient acceptability with minimal side effects, making it a promising option for the long-term management of hypopigmentation.

Keywords: Hypopigmentation, herbal cream, melanin, antioxidant, topical formulation.

Abstract-4

Formulation and evaluation of herbal shampoo

A. Sabane, B. Gandhre, B. Kolse and D. Ramdhan

Supervisor- Dr. Nilesh B. Banarase

Abstract:

The present study focuses on the formulation and evaluation of an herbal shampoo as a potential alternative to synthetic hair care products associated with adverse effects. The formulation was developed to achieve effective cleansing, moisturizing, and strengthening properties while minimizing the use of harsh chemicals. Optimization of surfactants, thickeners, and herbal extracts was carried out to attain desired viscosity and stability. Herbal ingredients such as Neem (*Azadirachta indica*), Shikakai (*Acacia concinna*), and Reetha (*Sapindus mukorossi*) were selected based on their well-established therapeutic properties. These ingredients function as natural surfactants and possess antimicrobial and anti-dandruff activities. Additionally, they are rich in bioactive constituents including alkaloids, flavonoids, saponins, and polyphenols, which contribute to improved scalp health and hair nourishment. The prepared formulation was evaluated for organoleptic characteristics, physicochemical parameters, and performance tests such as pH, viscosity, foam stability, surface tension, dirt dispersion, and wetting time. The results demonstrated satisfactory performance, stability, and safety for scalp application. The study concludes that the developed herbal shampoo offers an effective, safe, and environmentally sustainable alternative for modern hair care needs.

Keywords: Herbal shampoo, neem, shikakai, reetha, antidandruff.

Abstract-5

Formulation and evaluation of anti-lice roll on serum

K. Meshram, K. Burange, L. Wange and L. Fating

Supervisor- Mr. Krunal Takarkhede

Abstract:

Pediculosis capitis (head lice infestation) is a common problem, especially among school going children, causing itching, irritation, and discomfort. The present study focuses on the formulation and evaluation of an anti-lice hair roll-on using natural ingredients such as bhringraj extract, shikakai extract, and Rampal (*Annona reticulata*) seed extract, glycerin, Rose Oil, Clove Oil, and distilled water. These ingredients possess insecticidal, antimicrobial, and soothing properties that help in eliminating lice and preventing their recurrence. The roll-on formulation was designed for easy application, improved patient compliance, and targeted delivery to the scalp. Evaluation parameters included physical appearance, pH, viscosity, spread ability, stability, and anti-lice activity. The formulation showed acceptable pH suitable for scalp application, good stability, and effective lice control due to the synergistic action of components. The study concludes that the developed anti-lice roll-on is a safe, effective, and convenient alternative to synthetic pediculicides, which are often associated with side effects and resistance. This formulation can be further optimized and clinically evaluate for commercial use.

Keywords: Scalp, children, head lice, ramphal extract, hair, roll on.

Abstract-6

Emulgel for skin soothing application

P. Barange, P. Khante, R. Lokhande, R. Shelke and R. Bhojane

Supervisor- Ms. Samruddhi Khonde

Abstract:

The present study focuses on the formulation development and evaluation of a cosmetic Emulgel designed for skin-soothing applications. Emulgel combine the advantages of both emulsions and gels, offering improved stability, enhanced drug delivery, and better patient compliance. In this work, a soothing emulgel was formulated using suitable oil and aqueous phases containing skinfriendly ingredients such as moisturizing agents, emulsifiers, and gelling agents. The oil phase typically included emollients like liquid paraffin or natural oils, while the aqueous phase contained humectants such as glycerin and active soothing agents. Carbopol or similar polymers were used to prepare the gel base. The formulated emulgel was evaluated for various physicochemical parameters including appearance, pH, viscosity, spreadability, homogeneity, and stability. The pH was maintained within the skin-friendly range to avoid irritation. Viscosity and spreadability studies confirmed ease of application, while stability studies indicated no phase separation or degradation under different storage conditions. The formulation demonstrated good consistency, smooth texture, and effective soothing properties on application. Overall, the developed cosmetic emulgel proved to be a promising topical delivery system for skin soothing, combining aesthetic appeal with functional performance.

Keywords: Emulgel, skin soothing, cosmetic formulation, carbopol, stability evaluation.

Abstract-7

Formulation and evaluation of herbal deodorant using plant extract

S. Mahure, S. Sable, S. Gawai, S. Doye and S. Raut

Supervisor- Ms. Vaishnavi N. Ghati

Abstract:

Deodorant products are designed to control body odour by inhibiting the growth of bacteria that decompose sweat produced by apocrine glands. However, the use of synthetic antibacterial agents such as triclosan and aluminum salts may lead to adverse health effects, including skin irritation and other long-term risks. Therefore, there is increasing interest in developing herbal formulations using natural ingredients with antimicrobial properties. In the present study, a herbal deodorant formulation was developed using natural components such as chamomile oil, lavender oil, rosemary oil, peppermint oil, beeswax, coconut oil, and castor oil. Essential oils like chamomile, rose, and rosemary are known for their antibacterial activity, while peppermint oil provides a cooling and refreshing effect. Beeswax acts as a structuring agent, coconut oil serves as a moisturizer with mild antimicrobial properties, and corn starch functions as an absorbent to reduce moisture and odour. The prepared formulation was evaluated for various physicochemical parameters including physical appearance, pH, spreadability, consistency, stability, and antimicrobial activity. The results indicated that the formulation possessed a smooth texture, acceptable pH, good spreadability, and stability without any phase separation. Additionally, it demonstrated significant antibacterial activity comparable to conventional deodorant products.

Keywords: Herbal deodorant, antibacterial activity, essential oil, physiochemical evaluation, plant based antimicrobial.

Abstract-8

Formulation and evaluation of herbal lip tint using *Beta vulgaris* extract

P. Ikhar, P. Gawande, P. Darange and P.D. Thakre

Supervisor- Mr. Vaibhav D. Dapurkar

Abstract:

One of the cosmetic item that is frequently used is lip tint. Due to rising awareness regarding safety and sustainability, herbal cosmetics prepared using natural ingredients are gaining global importance. These research work is based on formulation and evaluation of herbal lip tint by using natural ingredient *Beta vulgaris* (Beetroot). *Beta vulgaris* (commonly known as beetroot) is a natural source of red violet pigments called betalains, particularly betacyanin. These pigments are water soluble and responsible for the characteristic deep red color of beetroot. This formulation applied on the lips to prevent drying, give tint of color to the lips and protect against adverse factors of the environment. The evaluation of lip tint is carried out by various parameters like texture, spreadability, colour, pH, stability, fragrance as well as its effectiveness in terms of hydration. The stability test are conducted to ensure that the quality of product maintain over time under various environmental condition. The further scope of herbal lip tint is highly promising, because of rising the global demand of herbal and natural beauty product. The adverse effect of synthetic lip tint or lip balm is removed by herbal lip tint. Moreover, there is great potential for innovation in this space, from customized tints to eco-friendly packaging and multipurpose application.

Keywords: Herbal ingredient, beetroot, hydration, formulation, evaluation.

Abstract-9

Formulation and evaluation of herbal hair dye gel

P. Ingale, P. Bargat, P. Bhonde, P. Jadhav and P. Mahajan

Supervisor- Mrs. Farah M. Khan

Abstract:

Herbal hair care products are becoming popular because they are safer and cause fewer side effects than chemical products. Chemical hair dyes can damage hair and irritate the scalp. So, this study aimed to prepare an herbal hair dye gel using natural ingredients like henna, amla, palash, hibiscus, and reetha. These ingredients help in colouring, cleaning, and strengthening the hair. The extracts of these herbs were prepared and mixed with a gel base made of Carbopol 940, glycerin, methyl paraben, triethanolamine, and distilled water. The prepared gel was evaluated for different parameters such as colour, smell, pH, viscosity, spreadability, homogeneity, and stability. The results showed that the gel had a suitable pH (around 6–7), good thickness, and was easy to apply on hair. It provided natural colour, improved hair texture, and helped in cleaning the scalp due to reetha. No irritation was observed and the gel remained stable during storage. Overall, the herbal hair dye gel was found to be safe, effective, and a good natural alternative to chemical hair dyes, with added benefits for hair health and scalp care.

Keywords: Herbal hair dye gel, henna, amla, palash, hibiscus, natural hair color.

Abstract-10

Formulation and evaluation of syndet based baby soap

L.Ingole, L. Aglawe, M. Rithe and M. Niwal

Supervisor- Mr. Mahesh Gadge

Abstract:

Baby skin is delicate and more prone to dryness, irritation, and microbial infections due to its thinner stratum corneum, higher pH, and lower lipid content compared to adult skin. Conventional soaps may disrupt the natural skin barrier because of their alkaline nature. Therefore, the present study focuses on the formulation and evaluation of a mild, skin-friendly syndet-based baby soap incorporating natural and herbal ingredients such as calendula oil, neem oil, lavender oil, aloe vera gel, and vitamin E. The soap base was prepared using a saponification process followed by a melt-and-pour method to ensure uniform incorporation of active ingredients. Key components such as coconut oil, castor oil, stearic acid, glycerin, ethanol, and sugar were used to enhance lather, hardness, transparency, and skin hydration. The prepared formulations were evaluated for organoleptic and physicochemical parameters including color, odour, texture, pH, foamability, foam retention, hardness, and skin irritation. The results indicated that the developed syndet-based baby soap exhibited good physical characteristics, stable foam properties, and no signs of skin irritation, confirming its suitability and safety for baby skin.

Keywords: Baby soap, syndet, baby skincare, herbal formulation, mild cleanser.

Abstract-11

Formulation and evaluation of multipurpose herbal foot cream

R. Surjuse, S. Kardikar, S. Charpe, S. Metkar and S. Mamurkar

Supervisor- Mr. Mohit A. Raut

Abstract:

The present study was aimed at the formulation and evaluation of a multipurpose herbal foot cream using natural ingredients such as neem (*Azadirachta indica*), bael (*Aegle marmelos*), and aloe vera. Herbal products are increasingly preferred due to their safety, effectiveness, and minimal side effects compared to synthetic formulations. The active constituents were extracted from neem and bael powders by the maceration method using a hydroalcoholic solvent system. Three formulations (F1, F2, and F3) were prepared using different concentrations of herbal extracts and evaluated for various physicochemical parameters including colour, odour, texture, homogeneity, washability, pH, spreadability, and antimicrobial activity. All formulations exhibited satisfactory physical characteristics with smooth texture, good homogeneity, and acceptable pH suitable for topical application. Antimicrobial studies showed no microbial growth, indicating effective antimicrobial activity of the formulations. Among the prepared batches, formulation F2 demonstrated better spreadability and overall performance compared to F1 and F3. The results suggest that the formulated herbal foot cream possesses moisturizing, healing, and antimicrobial properties and can serve as a safe, effective, and economical alternative to synthetic foot care products. The study concludes that herbal ingredients can be successfully incorporated into foot cream formulations for maintaining foot health and preventing microbial infections.

Keywords: Herbal foot cream, neem, bael, aloe vera, antimicrobial activity.

Abstract-12

Formulation and evaluation of herbal face sheet mask

A. Sirsat, A. Dukare, A. Watane and A. Mhaisgawli

Supervisor- Dr. Vikrant L. Salode

Abstract:

The growing preference for natural and skin-friendly cosmetic products has increased the interest in herbal sheet masks as an alternative to synthetic skincare formulations. The present study involved the formulation and evaluation of a polyherbal face sheet mask containing aloe vera gel, dragon fruit extract, carrot extract, licorice extract, orange powder, glycerin, vitamin E, rosemary oil, and Rose water. The formulation was prepared within a skin-compatible pH range of 5.10. The selected herbal ingredients were incorporated for their antioxidant, moisturizing, soothing, skin-brightening, and rejuvenating properties. Aloe vera provided hydration and soothing action, while dragon fruit extract contributed antioxidant activity. Licorice extract was included for depigmenting effect, carrot extract for skin renewal, and orange powder for natural vitamin C activity. Glycerin acted as a humectant, vitamin E as an antioxidant stabilizer, and rosemary oil improved skin conditioning. The prepared formulation was evaluated for physicochemical parameters. The formulation showed satisfactory homogeneity, suitable consistency, stable pH, and good spreadability without causing skin irritation. The developed herbal sheet mask demonstrated effective moisturizing and skin-softening properties, indicating its potential as a safe and effective herbal cosmetic formulation.

Keywords: - Herbal face sheet mask, licorice extract, dragon fruit extract, depigmentation, anti-aging effect.

Abstract-13

Formulation and evaluation of herbal hair mask

S. Bhunte, S. Salunke, S. Shaha, S. Yawale and S. Raut

Supervisor- Ms. Trusha R. Gurnule

Abstract:

Hair plays an important role in protecting the scalp and enhancing personal appearance. Continuous exposure to environmental factors, stress, nutritional deficiencies, and excessive use of chemical-based hair products can lead to various hair problems such as dandruff, hair fall, dryness, and loss of shine. The present study aimed to formulate and evaluate a polyherbal hair mask using natural ingredients including flaxseed mucilage, fenugreek seed mucilage, aloe vera gel, and hibiscus mucilage. Carbopol 940 was used as a gelling agent, while glycerin, sodium benzoate, and triethanolamine were incorporated to improve stability and formulation characteristics. Five different batches (F1–F5) were prepared and evaluated for organoleptic properties, pH, spreadability, stability, washability, consistency, and skin irritation. All formulations showed satisfactory physicochemical properties and remained stable under different storage conditions. The pH of the formulations was found within the acceptable range for scalp application, and no skin irritation was observed. Among all batches, formulation F2 exhibited the best overall performance with excellent spreadability, smooth texture, ideal pH, superior stability, and better user acceptability. The study concludes that the developed herbal hair mask is a safe, stable, and effective natural alternative to synthetic hair care products for maintaining healthy, nourished, and manageable hair.

Keywords: Herbal hair mask, flaxseed, fenugreek, aloe vera, hibiscus, hair care.

Abstract-14

Phytochemical based soap: Formulation and evaluation study

S. Pokale, S. Adokar, S. Wakilahmad, S. Kadu and S. Inkane

Supervisor- Mrs. Tejaswini G. Malge

Abstract:

The growing demand for herbal and chemical-free cosmetic products has encouraged the development of phytochemical based formulations with enhanced therapeutic benefits. The present study focuses on the formulation and evaluation of a herbal soap using *Moringa oleifera* and lemongrass essential oil as key active ingredients. *Moringa oleifera* is rich in phytoconstituents such as flavonoids, tannins, saponins, and phenolic compounds, which exhibit antioxidant, antimicrobial. And skin-protective properties. Lemongrass oil is well known for its antibacterial, antifungal, and refreshing fragrance. The soap was formulated using a glycerin base, followed by the incorporation of moringa extract and lemongrass oil in optimized concentrations. The prepared formulation was evaluated for various physicochemical parameters including pH, moisture content, foam height, foam retention, hardness, and stability. The results demonstrated that the formulated soap had a skin-compatible pH, good foaming ability, and satisfactory physical stability. The presence of phytochemicals contributed to enhanced antimicrobial activity against common skin pathogens. The formulation also exhibited good cleansing efficiency and was found to be non-irritating to the skin. In conclusion, the phytochemical-based herbal soap formulated with moringa and lemongrass oil can be considered a safe, effective, and eco-friendly alternative to conventional soaps, offering both cosmetic and therapeutic benefits.

Keywords: *Moringa oleifera*, lemongrass oil, phytochemicals, antimicrobial activity, antioxidant, glycerin soap base.

Published Scientific Papers Based on the Project Work Report



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FORMULATION AND EVALUATION OF HERBAL MOSQUITO REPELLENT CREAM

Rathod Durga, Pote Fatteshwar^{*}, Dukare Gayatri, Pandey Harshdeep and Ghulaxe Chetan

P. R. Patil Institute of Pharmacy, Talegaon, Ashti, Wardha - 442202, Maharashtra, India.

Keywords:

Repellent activity, Cymbopogon nardus, Spreadability, Lemongrass oil, Skin-friendly

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ABSTRACT: Herbal mosquito repellents are natural products designed to repel mosquitoes and other biting insects. They are made from plant-based ingredients, including essential oils, herbs, and other botanical extracts. Mosquito-borne diseases, including malaria, dengue, and Zika, constitute a formidable global health challenge, resulting in approximately 750,000 fatalities annually. This study aims to address this issue by formulating a plant-based mosquito repellent that prioritizes human safety and environmental sustainability. Citronella oil, thuja oil, lemongrass oil, rosemary oil renowned for its distinctive aroma, owes its insect-repellent properties to a combination of key constituents, including citronellal, eugenol, geraniol, and limonene. We used steam distillation and Clavanger apparatus for the extraction of oils. Three formulations, F1, F5 and F6, were developed with varying concentrations of these oils along with other excipients such as Bees wax, Glycerine, Cetyl alcohol, and Distilled water. The preparation involved separate heating and mixing of oil and water phases, followed by their combination to form a consistent cream. The study highlights the potential of natural oils in creating effective and skin-friendly mosquito repellent products. The prepared cream was evaluated for physicochemical parameters, stability, skin irritation, and mosquito repellent activity. The formulation showed good spreadability, skin compatibility, and effective mosquito repellency for up to 3–4 hours.

INTRODUCTION: Herbal mosquito repellents are natural products designed to repel mosquitoes and other biting insects. They are made from plant-based ingredients, including essential oils, herbs, and other botanical extracts. Mosquito-borne diseases, including malaria, dengue, and Zika, constitute a formidable global health challenge, resulting in approximately 750,000 fatalities annually. The expanding geographical range of mosquito species, exacerbated by climate change, is anticipated to further escalate the incidence of these diseases¹.

Mosquitoes are particularly attracted to humans due to carbon dioxide and lactic acid emissions, which are detected by specialized chemoreceptors located on the insect's antennae². This study aims to address this issue by formulating a plant-based mosquito repellent that prioritizes human safety and environmental sustainability. Citronella oil, Thuja oil, Lemongrass oil, renowned for its distinctive aroma, owes its insect-repellent properties to a combination of key constituents, including citronellal, eugenol, geraniol, and limonene³.



FIG. 1: REPRESENTATIVE IMAGE OF MOSQUITO

Citronella Oil: It is obtained by steam distillation from the fresh leaves of *Cymbopogon nardus* (Linn.) Rendle, family-Graminae. It is probably indigenous to Shri Lanka and cultivated in Myanmar, Malaysia, Indonesia, Fiji and Sri Lanka. In India, it is cultivated in Kerala. It is tall perennial, throwing dense fascicles of leaves from a short rhizome. The plant is quite stoul, erect, about 1.75 metres in height ⁴. The leaves are linear and tapering, upto 60-70 cm long, glabrous green and lower ribs are red in colour. Flowers are atheate panicles, 30-50 cm long and nodding. The grass has pleasant aromatic smell. It is cultivated by vegetative propagation from slips or even by sowing seeds. It needs to be irrigated regularly during winter and summer. The crop is ready for harvesting after eight months of growth. It can be harvested several times with regular intervals. About 20 tonnes of grass can be obtained in a hectare. The grass contains 0.4 to 0.5 per cent of volatile oil, with an average yield of 90 kg of oil per hectare. The oil is pale-greenish yellow in colour with pungent taste. It is insoluble in water, soluble in 80 per cent alcohol (1:10) and also in fixed oils ⁵.

Lemongrass Oil: The lemon grass oil is a volatile oil obtained by steam distillation from the leaves and parts of the plants *Cymbopogon flexuous* or *Cymbopogon citratis*, etc. belonging to family Graminae. It contains not less than 75 per cent of aldehyde calculated as citral. It is indigenous to India and found wild, as well as, cultivated throughout India ⁶.

It occurs in West Africa, Guatemala and East Africa. In India, it is grown in Kerala, Tamil Nadu, Karnataka, and Maharashtra. The West Indian lemon grass oil is derived from *Cymbopogon citrates*. This is mainly collected from plants grown in Gujarat, Maharashtra and Punjab. India produces about 900 tonnes oil per year. There is stiff competition from Guatemala in the trade of oil. Indian export of lemon-grass oil during 1995-96 &

96-97 was to the tune of 180 & 234 lakhs respectively ⁸.

Thuja Oil: The essential oil of *Thuja orientalis*, obtained from the leaves and branchlets was used as an anti-rheumatic, astringent, diuretically, emmenagogue, expectorant, insect repellent, rub-facing, stimulant and vermifuge substance ⁹. It belongs to Family Cupressaceae.

The main components of essential oil of Thuja were found to be α -humulene, α -pinene, sabinene limoneme, α -terpinolene, α -terpinyl acetate and cedrol. Thuja oil consists of thujone, which has theoretically poisonous characteristics and was premeditated for its antagonistic receptor GABA (c-amino butyric acid). Thuja's essential oil toxicity kills larvae that might have infested the organization due to the presence of thujone. Biochemical ingredients of *Thuja orientalis* like flavonoids and terpenoids have shown the natural accomplishments ¹⁰.

The oil of Thuja herbs compels the 5 α -reductase activities. Thuja oil is added to creams and lotions to repel mosquitoes due to its insect-repelling properties. Thuja oil is used in ointments for treating wits, skin tags, and other skin issues. Thuja oil is used in diffusers for its fresh, woody scent and potential respiratory benefits ¹¹.

Rosemary Oil: It is the volatile oil obtained from fresh flowering tops of the plant *Rosmarinus officinalise* family Labiatae. India Rosemary is indigenous to South Europe and South Asia. It is cultivated in Mediterranean basin and India ¹². Rosemary is an evergreen plant **Fig. 1** about 2 metres in height. It bears blue coloured racemes. The leaves of the plant are about 2.5 cm tall. It is cultivated in gardens and on slopes. Its cultivation is found successful on light calcarious soil. It is cultivated by sowing the seeds or with slips. After flowering, the plants are cut about 10 cm above the ground and steam distilled ¹³.

TABLE 1: COMPARATIVE PROFILE OF CITRONELLA OIL, LEMONGRASS OIL, AND THUJA OIL USED IN THE FORMULATION

Feature	Citronella Oil	Lemon Grass Oil	Thuja Oil
Botanical Source	<i>Cymbopogon nardus</i>	<i>Cymbopogon flexuosus</i>	<i>Thuja occidentalis</i>
Mechanism of Action	Disrupts cell membrane permeability and potential.	Penetrates microbial cell membranes.	Penetrates and disrupts cell membranes.
Anti-inflammatory ¹⁴	Inhibits COX and LOX pathways;	Suppresses COX-2 and	Inhibits inflammatory

Microbial Impact ¹⁵	reduces prostaglandins. Leads to loss of intracellular ions and proteins.	LOX pathways. Causes leakage of ions (Na, K) and cell death	mediators like leukotrienes. Causes leakage of intracellular content and cell death.
Antioxidant ¹⁶	Scavenges reactive oxygen species (ROS). Inhibit lipid peroxidation.	Scavenges free radicals. Prevent lipid peroxidation.	Scavenges free radicals and prevents lipid peroxidation.
Insect Repellent ^{17,18}	Nervous system disruption citronella interacts with octopamine receptors (in insects)	Acts on octopamine receptors. Cause Nervous system disruption. Leads to paralysis and insect death.	Neuro sensory interference. Thuja is a neuroactive monoterpenes. Cause sensory irritation.

The aim of the study is to address issue by formulating a plant-based mosquito repellent that prioritizes human safety and environmental sustainability. To formulate a stable herbal mosquito repellent cream using natural essential oils such as: *Cymbopogon nardus* (Citronella oil) *Cymbopogon citratus* (Lemongrass oil) *Thuja occidentalis* (Thuja oil) *Salvia rosmarinus* (Rosemary oil).

To develop a safe and skin-friendly formulation using suitable emulsifying agents and excipients. To assess mosquito repellent activity of the formulation against common mosquito species under laboratory conditions. To ensure safety and non-irritancy through skin irritation testing.

METHODS AND MATERIALS:

Material:

1. Citronella Oil (extracted in lab)
2. Lemongrass Oil (extracted in lab)
3. Thuja Oil ¹⁹ (ordered from amazon.com)
4. Rosemary Oil ²⁰ (issue from lab)

Excipients:

1. Beeswax
2. Cetyl Alcohol
3. Liquid Paraffin
4. Methyl Paraben
5. Citric Acid
6. Distilled Water

Extractions Method of Plant Material: The Clevenger apparatus is designed for volatile oil extraction *via* hydrodistillation, using a round-bottom flask, condenser, and graduated trap to

separate essential oils from plant matter by density. It operates by boiling plant material in water, condensing the vapor, and collecting the oil, which floats on the water and returns to the flask ¹⁹. Place the fresh or dried citronella leaves and lemongrass leaves (e.g., 100g–110g) into a 500ml tow different round-bottom flask. Add distilled water to the flask (typically 200–250 mL), ensuring the material is fully immersed to avoid scorching. Connect the flask to the Clevenger trap and attach a condenser on top. Secure all joints with clips to prevent vapor leaks. Heat the mixture using a heating mantle. Steam carries the volatile compounds into the condenser, where they liquefy and drop into the trap. The mixture in the trap separates into a water layer and a lighter or heavier oil layer. The water continuously flows back into the flask. Continue distillation for 1–3 hours or until no more oil collects in the graduation tube ^{21, 22}.

Citronella Leaves: 100 g plant material (citronella leaves). 500ml distilled water.

Experimental Procedure: Time 3 to 4 hour. Oil obtained 0.5 – 1ml (approx.)

TABLE 2: YIELD OF CITRONELLA OIL OBTAINED FROM DIFFERENT QUANTITIES OF LEAVES

Leaves used	Oil obtained
100 g	0.5 -1.2 g
500 g	2.5 -6 g
1 kg	5 -12 g

Lemongrass Leaves: 100g plant material (Lemongrass leaves). 500ml distilled water

Experimental Procedure: Time 3 to 4 hour. Oil obtained 0.8 – 1.5ml (approx.)

TABLE 3: YIELD OF LEMONGRASS OIL OBTAINED FROM DIFFERENT QUANTITIES OF LEAVES

Leaves used	Oil obtained
100 g	0.8 – 1.5g
500 g	4 – 7.5g
1 kg	8-15g

Formulation Process²³:

Oil Phase Preparation: Take bees wax, cetyl alcohol, methyl paraben and liquid paraffin in a beaker.

Heat at ~70 C until completely melted.

Aqueous Phase Preparation: Take a purified water in another beaker. Heat to same temperature.

Emulsification: Add oil phase slowly into aqueous phase. Stir continuously until uniform cream forms.

TABLE 4: COMPOSITION OF DIFFERENT CREAM FORMULATIONS (C1–C7) FOR OPTIMIZATION OF HERBAL MOSQUITO REPELLENT CREAM

Formulation	Propertise	C1	C2	C3	C4	C5	C6	& 7
Bees Wax	Thickening agent	7.5	10	12	6	5	7	5.5
Cetyl Alcohol (g)	emulsifier	2.5	3	3	2	1.5	2.5	2
Liquid Paraffin (ml)	Work as emollient	25	22	20	27	23	30	24
Methyl paraben (ml)	preservative	4.0	3.4	3.0	4.5	4.3	4.2	4.6
Water (ml)	Aqueous phase	15	12	10	18	20	12	22

TABLE 5: FORMULATIONS OF SINGLE-OIL CREAMS

Citronella		Lemongrass		Thuja	
Ingredients	Quantity	Ingredients	Quantity	Ingredients	Quantity
Citronella oil	22 drops	Lemongrass oil	12 drops	Thuja oil	3 drops
Bees wax	7g	Bees wax	7g	Bees wax	7g
Cetyl alcohol	2.5g	Cetyl alcohol	2.5g	Cetyl alcohol	2.5g
Liquid paraffine	30ml	Liquid paraffine	30ml	Liquid paraffine	30ml
methylparaben	4.2ml	methylparaben	4.2ml	methylparaben	4.2ml
Distilled water	12ml	Distilled water	12ml	Distilled water	12ml

TABLE 6: FORMULATIONS OF TWO-OIL COMBINATION CREAMS

Citronella + Lemon		Lemongrass + Thuja		Citronella + Thuja	
Ingredient	Quantity	Ingredient	Quantity	Ingredient	Quantity
Citronella oil	22 drops	Lemongrass oil	12 drops	Citronella oil	22 drops
Lemongrass oil	12 drops	Thuja oil	3 drops	Thuja oil	3 drops
Rosemary	5 drops	Rosemary	5 drops	Rosemary	5 drops
Bees wax	7g	Bees wax	7g	Bees wax	7g
Cetyl alcohol	2.5g	Cetyl alcohol	2.5g	Cetyl alcohol	2.5g
Liquid paraffine	30ml	Liquid paraffine	30ml	Liquid paraffine	30ml
methylparaben	4.2ml	methylparaben	4.2ml	methylparaben	4.2ml
Distilled water	12ml	Distilled water	12ml	Distilled water	12ml

TABLE 7: FORMULATION OF FOUR-OIL COMBINATION CREAM

Citronella + Lemongrass + Thuja	
Ingredient	Quantity
Citronella oil	8 drops
Lemongrass oil	6 drops
Thuja oil	3 drops
Rosemary	5 drops
Bees wax	7g
Cetyl alcohol	2.5g
Liquid paraffine	30ml
methylparaben	4.2ml
Distilled water	12ml

All of the above tables are formulated according to C6 optimise batch formula.



FIG. 2: DIFFERENT FORMULATIONS OF HERBAL MOSQUITO REPELLENT CREAM

Evaluation Parameter:

1. Organoleptic Properties
2. PH determination
3. Spreadability
4. Washability test
5. Microbial study
6. Anti-oxidant

**FIG. 3: PREPARED HERBAL MOSQUITO REPELLENT CREAM****TABLE 8: ORGANOLEPTIC PROPERTIES OF THE CREAM FORMULATIONS**

Sr. no	Texture	Spreadability	Greasiness	Stability
F1	Creamy, soft	Good	Good	Good
F2	Thick	Low	Low	Low
F3	Hard /solid like	Poor	Poor	Moderate
F4	Hard	Poor	Poor	Low
F5	Smoothy/creamy	Good	Good	Good
F6	Smooth/good	Good	Good	Very good
F7	Smooth	Good	Good	Good

pH Determination: A definite amount of cream (100mg) was weighed, diluted in 100ml distilled water, and mixed well. The pH of the cream was recorded using Digital pH Meter (Mettler Toledo).

pH evaluation was carried out for all experimental formulations. The measurement was carried out in triplicate²⁴.

TABLE 9: pH OBSERVATIONS OF DIFFERENT CREAM FORMULATIONS

Cream name	pH reading			Mean	±SD
	1	2	3		
Citronella oil cream	5.2	6	5.8	5.67	± 0.42
Lemongrass oil cream	5.43	5.9	6.3	5.88	±0.44
Thuja oil cream	5.44	5.2	5.5	5.38	±0.16
Citronella and lemongrass oil cream	5.40	5.31	5.2	5.30	±0.10
Lemongrass and thuja	5.29	5.12	5.25	5.22	±0.09
Citronella and thuja	5.20	5.2	5.4	5.27	±0.12
mix	5.45	5.2	5.5	5.38	±0.16

Spreadability: Take 1g of cream. Place it at the center of a glass slide. Place another glass slide over it apply slight pressure to get uniform thickness keep 5min this ensure proper spreading and removal of air attach thread to upper slide apply pulling weight^{25, 26}.

Formula:

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

Where, S = Spreadability, M = Weight (g) tied to the upper slide (or applied weight), L = Length moved by the glass slide (cm), T = Time taken (seconds).

**FIG. 4: SPREADABILITY TEST OF HERBAL CREAM FORMULATION**

Advantages:

1. Indicates Ease of Application -Helps determine how easily the cream spreads on the skin, ensuring smooth and uniform application.
2. Improves Patient/User Compliance
3. Ensures Uniform Drug Distribution

TABLE 10: OBSERVATION OF SPREADABILITY OF DIFFERENT CREAM FORMULATIONS

Sr. no.	Cream	Weight (g)	Length (CM)	Time (Sec)	$S = M \times L / T$
1	Citronella Cream	50g	6.2	1Min(60Sec)	5.1 g.cm/sec
2	Lemongrass Cream	50g	5.8	1Min(60Sec)	4.8g.cm/sec
3	Thuja Cream	50g	6.1	1Min(60Sec)	5.0 g.cm/sec
4	Citronella + Lemongrass Cream	50g	5.8	1Min(60Sec)	4.8 g.cm/sec
5	Lemongrass+ Thuja Cream	50g	6.6	1Min(60Sec)	5.5 g.cm/sec
6	Citronella+ Thuja Cream	50g	5.9	1Min(60Sec)	5.9 g.cm/sec
7	Citronella + Lemongrass+ Thuja +Rosemary Oil Cream	50g	6.1	1Min(60Sec)	5.0 g.cm/sec

Washability Test: A known amount of cream is applied on the skin and then washed with water the ease of removal indicate washability take small amount of cream select a clean area on the forearm or glass plate spread uniformly over a fixed area allow the cream to remain for 5 min wash with tap water or distilled water gently rub with fingers. The interpretation was good washability and observes it has easily washable²⁷.

**FIG. 5: WASHABILITY TEST OF HERBAL CREAM****Observation:**

- Easily Washable (Good Washable)
- Slight Residue (Moderate)
- Difficult Removal (Poor Wash)

Microbial Study: Suspend nutrient agar powder and other ingredients (mentioned under chemical formula) in required quantity of distilled water. Heat this mixture while stirring to fully dissolve all components. Pour the media in conical flask and cover it with cotton plug. Autoclave the dissolved mixture contained in conical flask at 121°C for 20

minutes. Once the nutrient agar has been autoclaved, allow it to cool and preserve it for further use.

TABLE 11: CHEMICAL COMPOSITION OF NUTRIENT AGAR

Sr. no.	Ingredients	Quantity
1	Peptone	0.5g
2	Beef extract	0.3g
3	Sodium chloride	0.5g
4	Agar	2g
5	Distilled water	100ml

RESULT: The antimicrobial activity of the formulated herbal mosquito repellent cream was evaluated using the agar well diffusion method. The test samples exhibited visible zones of inhibition around the wells in all experimental plates, indicating susceptibility of the test microorganism(s) to the formulation.

Anti-oxidant: Various type of free radical scavenging molecules is found in plants which act as a natural product, rich in antioxidant properties³. That's why plants extract is displayed various biological activities such as antioxidant properties⁴. Antioxidant molecules can be suppressed the oxidative reaction which is instigated by the free radicals. H₂O₂ scavenging method: Antioxidant activity of individual extract was evaluated by using H₂O₂ method²³. 0.1ml of sample added with 3.4 ml of 0.1 M phosphate buffer and 0.6 ml of 40 mM H₂O₂. This mixture was incubated 10 mints at room temperature. After incubation, absorbance was note down at λ_{max} 230 nm against blank solution. Ascorbic acid was used as standard **Fig. 5**. The percentage scavenging of H₂O₂ was calculated using the equation.

$$\% \text{ scavenging of } H_2O_2 = (A_0 - A_1) / A_0 \times 100$$

Observation table in U.V

Sample 1: For base line correction (sodium Dihydrogen Phosphate Buffer 7.4 PH Buffer solution)

Sample 2: Buffer + Hydrogen peroxide (H_2O_2)
 $A_0=0.50$

Sample 3: Hydrogen Peroxide + Dillution of Cream
 sample $A_1 = 6.6646$

$$\% \text{ scavenging of } H_2O_2 = (A_0 - A_1) / A_0 \times 100$$

$$= -0.5074 - 6.6646 / 0.5074 \times 100$$

$$= 14.12$$

Irritancy Test: The irritancy test involved applying the cream to a marked area on the dorsal surface of the left hand. The area was monitored for signs of irritancy, redness (erythema), and swelling (edema) at regular intervals over 24 hours.

Arm Cage Method: The evaluation of mosquito repellent activity employs a cardboard frame cage with a cardboard bottom, one side netted for ventilation, plastic paper sides for viewing, and a front net area for access. To begin, mosquitoes are placed in the cage, and a control test is conducted without applying any cream to determine the number of mosquito bites.

Next, the first concentration of the mosquito repellent cream (F1) is applied to a square section of skin on the hand, which is then inserted into the cage, protected by a glove and muslin cloth, leaving only the treated skin area exposed. The number of mosquitoes repelled is observed and recorded for 2 minutes.

This process is repeated for each concentration of the mosquito repellent cream, and the data is analyzed by comparing the number of mosquito bites in the control test to the number of mosquitoes repelled in each treatment test.

TABLE 12: MOSQUITO REPELLENT ACTIVITY OF FORMULATION F7 BY ARM CAGE METHOD

Formulation no.	Parameter	Control	Test
F7	Number of Mosquitoes	10	10
	Number of mosquitoes repels	0	3
	Repellent activity	No	Yes
	Observation Time(min)	3	3
	Temperature 0C	38	38



FIG. 6: ARM CAGE METHOD FOR EVALUATION OF MOSQUITO REPELLENT ACTIVITY

CONCLUSION: The development of plant-based mosquito repellents offers a promising solution to prevent mosquito borne diseases. The bioactive compounds present in citronella, lemongrass,

rosemary, and thuja essential oils demonstrate potential as effective mosquito repellents, with possible synergistic effects when combined. All of the formulations showed high spreadability, simple

washability, pH levels appropriate for skin application, and acceptable physical features. The compositions are safe for topical application, according to preliminary dermatological testing that showed no symptoms of skin irritation. These results imply that the created herbal cream is a viable, all natural substitute for synthetic repellents, providing a skin compatible and environmentally responsible method of personal mosquito protection. To improve its effectiveness and practical application for widespread use in mosquito-prone areas, more research is advised, including long-term stability tests, prolonged field trials, and essential oil mixture optimization.

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**FORMULATION DEVELOPMENT AND EVALUATION OF COSMETIC EMULGEL FOR
SKIN SOOTHING APPLICATION****Rashmi Lokhande*, Priti Barange, Puja Khante, Rasika Shelke, Rohini Bhojane, Samruddhi Khonde**

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ABSTRACT

The present study focuses on the formulation development and evaluation of a cosmetic emulgel designed for skin-soothing applications. Emulgels combine the advantages of both emulsions and gels, offering improved stability, enhanced drug delivery, and better patient compliance. In this work, a soothing emulgel was formulated using suitable oil and aqueous phases containing skin-friendly ingredients such as moisturizing agents, emulsifiers, and gelling agents. The oil phase typically included emollients like liquid paraffin or natural oils, while the aqueous phase contained humectants such as glycerin and active soothing agents. Carbopol or similar polymers were used to prepare the gel base. The formulated emulgel was evaluated for various physicochemical parameters including appearance, pH, viscosity, spreadability, homogeneity, and stability. The pH was maintained within the skin-friendly range to avoid irritation. Viscosity and spreadability studies confirmed ease of application, while stability studies indicated no phase separation or degradation under different storage conditions. The formulation demonstrated good consistency, smooth texture, and effective soothing properties on application. Overall, the developed cosmetic emulgel proved to be a promising topical delivery system for skin soothing, combining aesthetic appeal with functional performance.

KEYWORDS: Emulgel, Skin soothing, Cosmetic formulation, Carbopol, Stability evaluation.**INTRODUCTION**

After hair removal procedures such as waxing, the skin often experiences irritation, redness, inflammation, and dryness due to mechanical stress on the skin surface. In several cases, the skin becomes sensitive and may also exhibit a burning sensation, leading to discomfort. Considering these common post-waxing concerns, the present work focuses on the development of a herbal emulgel intended for soothing and protecting the skin. The formulation is designed to provide effective relief while promoting skin recovery through the use of natural ingredients possessing anti-inflammatory and antioxidant properties. Thus, the selection of an appropriate topical drug delivery system such as an emulgel ensures improved penetration, stability, and patient compliance.

Topical drug delivery implies the application of a drug-containing formulation to treat the skin infection on the surface of the skin directly. Gel formulations typically

offer faster medication release than traditional ointments and lotions. Topical channels such as the skin, rectal, vaginal, and ophthalmic are utilized to deliver drugs for localized action on the body. Emulgels are created to overcome the fundamental constraint of gels, which is the difficulty in delivering hydrophobic medications. Emulgels are emulsions of the oil-in-water or water-in-oil variety that have been combined with a gelling agent to form a gel. The most reliable and effective delivery system for hydrophobic or poorly water-soluble medicines is emulsified gel. In simple terms, Emulgels are the fusion of an emulsion and a gel. Emulgels are typically utilised when other drug delivery methods fall short in their ability to effectively treat the skin conditions such as bacterial and fungal infections, acne, psoriasis, etc.^[1-3]

In recent times, there has been great interest towards the use of novel polymers which can be used as emulsifiers and

thickeners and the gelling capacity of these compounds is more and allows the formulation of stable emulsions and creams. This act by increasing the viscosity of the aqueous phase and at the same time decreasing surface and interfacial tension. Due to the presence of a gelling agent in the water phase converts a classical emulsion into an emulgel. These Emulgels for Topical uses have the various useful properties like being thixotropic, bio-friendly, water-soluble, greaseless, easily spreadable, emollient, easily removable, non- staining, greater shelf life, clear & pleasant appearance.^[4,5]

Penetration of Drug through Human Skin

The skin is the largest organ of the body, with a total area of about 20 square feet. The skin protects us from microbes and the elements, helps regulate body temperature, and permits the sensations of touch, heat, and cold.

Skin has three layers.

- Waterproof barrier and creates our skin tone.
- The dermis, beneath the epidermis, contains tough connective tissue, hair follicles, and sweat glands.
- The tissue deeper subcutaneous (hypodermis) is made of fat and connective tissue.

Penetration pathways

There are three penetration pathways available for topically applied drugs.

- Intercellular
- Follicular
- Transcellular

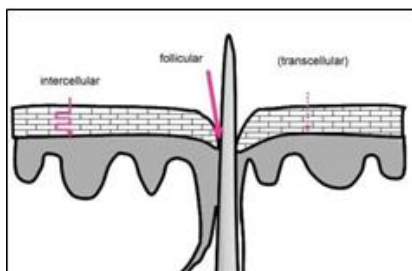


Figure 1: Schematic drawing showing the skin surface interrupted by a follicular orifice and demonstrating the three possible penetration pathways for topically applied substances through the skin barrier.

Intercellular: It is defined as the transport of drugs through junction between the epithelial cells.

Intracellular: It is defined as passage of drugs across the epithelial cells.

Follicular: Here the hair follicle acts as a pathway for penetration of topically applied drugs.^[6-9]

EMULGEL: Emulsion + Gel

Emulgels combine gel and emulsion benefits as controlled topical drug delivery systems. They are o/w or w/o emulsions gelled with a gelling agent. Gels provide mucoadhesion for prolonged skin contact; o/w for washability, w/o for dry skin emolliency. Less thixotropic emulsions aid penetration; gelling boosts emulsion stability and stratum corneum permeation. Gels outperform creams/ointments in dermatological ease and stability. For BCS Class II drugs (low solubility, high permeability), emulgels overcome dissolution limits, serving as stable vehicles for hydrophobic drugs.^[10]

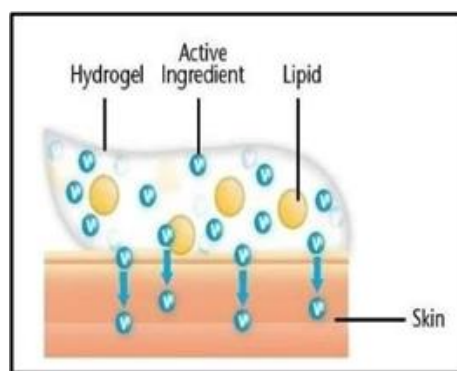


Figure 2: Emulgel.^[11]

TYPES OF EMULGELS

1. Based on the Type of API
2. Based on the type of emulsion

Based on the Type of API

- **Herbal/poly-herbal**

Example:

- i. Cosmetic Emulgel for skin care from field pumpkin.
- ii. Anti-psoriatic Emulgel from babchi oil and Gum Guggule.

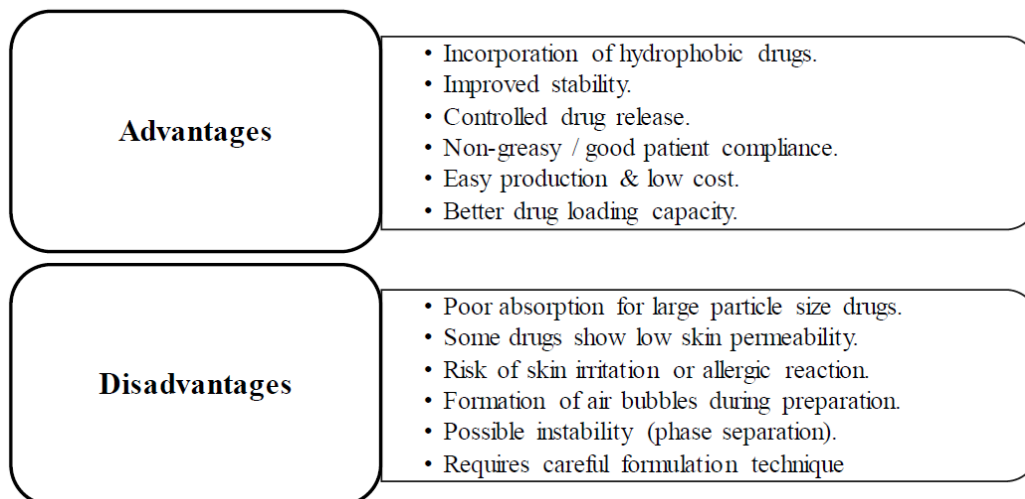
- **Allopathic**

Example

- i. Diclofenac diethyl Ammonium Emulgel (VOLTAREN) by NOVARTIS PHARMA.

Based on the type of Emulsion

- **Macroemulgel:** Size of dispersed phase droplets more than 400nm and prepared by High Energy and Low Energy Method.
- **Microemulgel:** Droplet Size Between 1nm to 100nm. Prepared by Phase Inversion And Phase Titration Method.
- **Nanoemulgel:** Droplet size is less than 1nm.

Advantages & Disadvantages of emulgel^[12-14]**Factors Affecting Topical Absorption of Drug.^[15-16]****1. Physiological factors**
☐

- ☐ Skin thickness
- ☐ Lipid content
- ☐ Density of hair follicles
- ☐ Density of sweat glands
- ☐ Skin pH
- ☐ Blood flow
- ☐ hydration of skin
- ☐ inflammation of skin

2. Physicochemical factors
☐

- ☐ Partition coefficient
- ☐ Molecular weight (<400 Dalton)
- ☐ Degree of ionization (Unionized drugs absorb better)
- ☐ Effect of vehicle

The rationale of emulgel as topical drug delivery

Various semisolids and other preparations are available on the market for restoring the skin's fundamental role or pharmacologically altering an operation to the underline tissue. The formulations, such as lotions, ointments and creams have several drawbacks, including being sticky, having a low spreading coefficient, and having stability issues. Only transparent gels have exposure in pharmaceutical and cosmetic preparations due to overall limitations within the semisolid preparations. As a result, an emulsion-based solution is used to address this limitation. Hence, the hydrophobic moiety of the drug should be incorporated and provided through gels. Drug/oil/water emulsions may be used to integrate hydrophobic drugs into emulgel. Since solubility acts as a barrier, most drugs cannot be inserted directly into gel bases, causing problems during drug release. The emulgel system helps to incorporate a hydrophobic drug into the oil phase, after which oily globules are easily dispersed into the aqueous phase, resulting in an oil/water emulsion. The emulsion can be mixed into the gel base. This may result in enhanced drug stability and release

over simply incorporating the drug into the gel base.^[17-18]

METHODS AND MATERIALS**Methods****1. Maceration Process of Amla Leaves (*Emblica officinalis*) Sample Preparation**

Fresh leaves of *Emblica officinalis* were collected, washed thoroughly with distilled water to remove dirt and impurities. Leaves were shade-dried and then ground into a coarse powder.



Figure 3: Amla Leaves Powder.

Maceration Procedure

1. About 10 g of powdered Amla leaves was taken in a clean container.
2. It was soaked in 100 mL of solvent (distilled water / ethanol / hydroalcoholic solution 50:50).
3. The mixture was kept at room temperature for 5–7 days with occasional stirring to ensure proper extraction of phytoconstituents.
4. After maceration, the mixture was filtered using muslin cloth or Whatman filter paper.
5. The filtrate was concentrated using a water bath or rotary evaporator at controlled temperature.
6. The dried extract was collected and stored in amber-colored containers for further use.^[19-21]



Figure 4: Herbal Amla Extract.

2. Maceration Process of Brahmi Leaves (*Bacopa monnieri*) Sample Preparation

Fresh leaves of *Bacopa monnieri* were collected and washed with distilled water. Leaves were shade-dried and pulverized into coarse powder.



Figure 5: Brahmi Leaves Powder.

Maceration Procedure

1. Approximately 10 g of Brahmi leaf powder was taken in a container.
2. The powder was macerated with 100 mL of solvent (distilled water/ ethanol / hydroalcoholic mixture 50:50).
3. The mixture was allowed to stand for 5-7 days at room temperature with intermittent shaking or stirring.
4. After extraction, the mixture was filtered.
5. The filtrate was evaporated using a water bath or rotary evaporator to obtain a concentrated extract.
6. The dried extract was stored in airtight amber containers.^[22-24]



Figure 6: Herbal Brahmi Extract.

Method of Preparation

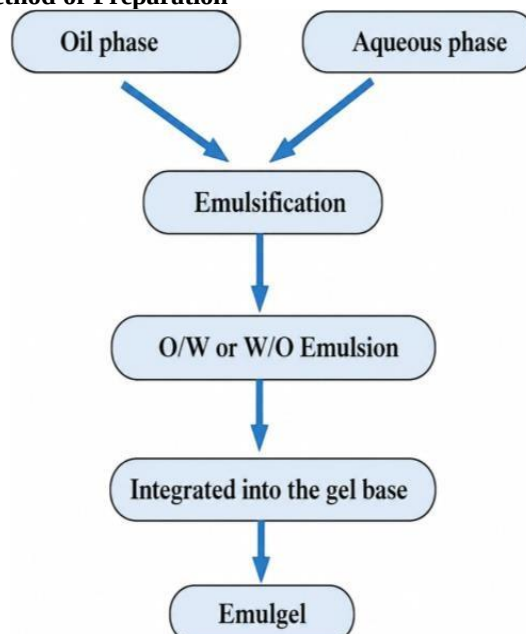


Figure 7: Method of Preparation of Emulgel.

Step 1: Preparation of Gel Base

Take purified water and slowly disperse Carbopol 934 with continuous stirring. Allow it to hydrate properly (30–60 min). Adjust pH to 6–6.5 using Triethanolamine to form a clear gel.

Step 2: Preparation of Emulsion

Oil Phase

Dissolve Castor oil and span 80 and add rose oil in suitable container and heat the mixture to 70–80°C

Aqueous Phase

Dissolve tween 20, boric acid, zinc oxide, urea, xanthum gum, herbal extract (amla, brahmi) and sodium citrate in sufficient amount of water.

Step 3: Preparation of Emulgel

Mix prepared emulsion with gel base in 1:1 ratio. Stir continuously until a uniform emulgel is obtained.^[25,26]

FORMULATION TABLE

Table 1: Ingredients for formulation of Cosmetic Emulgel.

Sr. No.	Ingredients	F ₁	F ₂	F ₃	F ₄	F ₅
1	Herbal extract	2 ml	2 ml	2 ml	2 ml	2 ml
2	Boric acid	0.3 g	0.3 g	0.3 g	0.3 g	0.3 g
3	Zinc oxide	1.5 g	1.5 g	1.5 g	1.5 g	1.5 g
4	Urea	1.5 g	1.5 g	1.5 g	1.5 g	1.5 g
5	Glycerine	1.5 ml	1.5 ml	1.5 ml	1.5 ml	1.5 ml
6	Sodium citrate	0.15 g	0.15 g	0.15 g	0.15 g	0.15 g
7	Castor oil	0.3 ml	0.3 ml	0.3 ml	0.3 ml	0.3 ml
8	Rose oil	-	-	1-2 drops	1-2 drops	1-2 drops
9	Carbopol 394	0.4 g	0.3 g	0.3 g	0.2 g	0.3 g
10	Xanthan gum	0.2 g	0.3 g	0.3 g	0.3 g	0.3 g
11	Tween 20	0.4 ml	0.4 ml	0.4 ml	0.3 ml	0.3 ml
12	Span 80	0.2 ml	0.3 ml	0.4 ml	0.3 ml	0.3 ml
13	Triethanolamine	2-3 drops	2-3 drops	2-3 drops	2-3 drops	2-3 drops
14	Water	q.s	q.s	q.s	q.s	q.s



Figure 8: Shows the formulation which we have prepared in our lab.

EVALUATION OF THE EMULGEL

1. Physical examination

The prepared emulgel formulations were visually assessed for color, uniformity, texture and phase separation.^[27,28] The results are recorded.

2. Determination of pH value

In, the pH value of the preparation led to the decision to use a virtual pH meter. The electrode of the pH meter is washed with distilled water, then the preparation is immersed to measure the pH and this process is repeated three times.^[28-29]

The pH of the emulgel formulation were recorded. The emulgel formulated in the work was pH value is 5.74, which is close to neutral pH. This was recorded.



Figure 9: Digital pH Analysis of Herbal Emulgel (Formulation F3).

3. Spreadability test

The spreadability test of the sample was determined using the following method: the prepared cream was applied between the two glass slides and compressed between the two glass slides to a uniform thickness by placing 500 ± 1 g of weight for 5 min. Then, weight was added to the weighing pan.³⁴ The value of Spreadability was calculated through the following equation

Spreadability = $(W \times L) / T$ Where,

W: Weight tight to the upper slide L: Length moved on

the glass slide

T: Time taken in seconds^[30]

The spreadability of emulgel was 2.8 cm (easily spreadable)

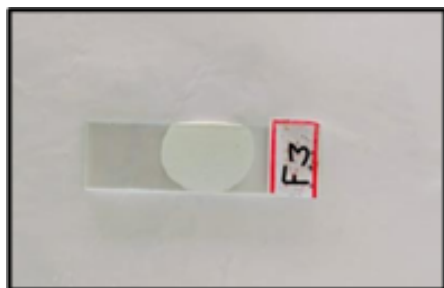


Figure 10: Spreadability Assessment of Herbal Emulgel Using Glass Slide Method.

4. Patch Test/Sensitivity test

Human volunteers (n = 3) were selected for patch test. Formulation (1 g) was applied on the forearm of the volunteers in the form of bandage disc and then covered with surgical dressing. After 24 h, the patches were removed and the areas were washed with saline fluids. The volunteers were asked for any irritation and the areas of application were observed for the presence/absence of edema and erythema (redness of skin).^[31]

5. Centrifugation study

This procedure is used to determine the emulgel's stability. After a week of preparation, it is completed. The experiment was carried out in a minicentrifuge at 3000 rpm for 30 minutes. The presence or absence of phase separation was observed.^[32]



Figure 11: Evaluation of Physical Stability of Emulsion System.

RESULT

Evaluation Parameters of Cosmetic Emulgel

Table 2: Evaluation Parameters of Cosmetic Emulgel.

S.no.	Test	F ₁	F ₂	F ₃	F ₄	F ₅
1	Appearance	Smooth	Smooth	Smooth	Smooth	Smooth
2	Color	Milky white	Milky white	Milky white	Milky white	Milky white
3	Odour	Characteristic	Characteristic	Pleasant	Pleasant	Pleasant
4	Wash-ability	Washable	Washable	Washable	Washable	Washable

Viscosity

The viscosity of the emulgel was measured using a Brookfield viscometer (DV-E VSCOMETER). The emulgel was weighed 50 gm. The emulgel was put into a measuring container and the spindle of the Brookfield viscometer was dipped into the formulation then measured the viscosity by using spindle no.6 at 30rpm.^[33]



Figure 12: Determination of Viscosity of Prepared Herbal Emulgel (F3).

6. Homogeneity

After the generated gels were placed in the container, they were all visually inspected for homogeneity. They had examinations to check for aggregates and to see how they looked.^[34]



Figure 13: Formation of Homogeneous.

5	pH	5.56	6.29	5.74	6.39	6.07
6	Viscosity	17769	31072	38517	43000	45654
7	Spreadability test	2.1	2.5	2.8	2.6	2.3
8	Stability test	Stable	Stable	Stable	Stable	Stable
9	Homogeneity	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous
10	Skin irritation test	No irritation	No irritation	No irritation	No irritation	No irritation

DISCUSSION

The present study focused on the formulation and evaluation of a herbal cosmetic emulgel intended for post-wax skin soothing application. All the prepared formulations (F1–F5) showed satisfactory physicochemical characteristics including smooth appearance, homogeneity, good washability, and absence of phase separation, indicating successful formulation of the emulgel system.

The pH of all formulations was found within the range of normal skin pH, suggesting suitability for topical application without causing irritation. Viscosity studies revealed that an increase in polymer concentration enhanced the viscosity of the formulation, which subsequently influenced spreadability. An optimum balance between viscosity and spreadability is important for easy application and patient compliance.

Among all formulations, F₃ showed optimum viscosity, good spreadability, pleasant odour, acceptable pH, and satisfactory stability, indicating better overall performance compared to other batches. Stability studies confirmed that the prepared emulgels remained physically stable without any sign of phase separation after centrifugation.

The herbal extracts of Amla (*Emblica officinalis*) and Brahmi (*Bacopa monnieri*) contributed beneficial antioxidant, soothing, and anti-inflammatory properties which may help in reducing redness, irritation, and discomfort associated with waxing. Furthermore, the absence of erythema and edema during patch testing confirmed the dermatological safety of the prepared formulation.

Thus, the developed herbal emulgel may serve as a promising and patient-friendly topical formulation for post-wax skin soothing application.

CONCLUSION

The present work successfully formulated and evaluated a herbal cosmetic emulgel for post-wax skin soothing application. All formulations exhibited satisfactory physicochemical properties, good homogeneity, stability, spreadability, and skin compatibility.

Among the prepared batches, formulation F3 was identified as the optimized formulation based on its suitable pH, viscosity, spreadability, stability, and pleasant aesthetic characteristics. The incorporation of herbal extracts such as Amla and Brahmi enhanced the

soothing and protective properties of the formulation.

The developed herbal emulgel may serve as a safe, stable, and effective alternative to conventional post-wax soothing preparations. However, further long-term stability studies and clinical evaluations are recommended to establish its therapeutic effectiveness and commercial applicability.

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FORMULATION AND EVALUATION OF HERBAL FACE SHEET MASK**Anajli A. Sirsat, Avantika N. Watane*, Anurdha P. Dukare, Ayush R. Mhaigawli, Dr. Vikrant Salode Sir**

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ABSTRACT

The growing preference for natural and skin-friendly cosmetic products has increased the interest in herbal sheet masks as an alternative to synthetic skincare formulations. The present study involved the formulation and evaluation of a polyherbal face sheet mask containing aloe vera gel, dragon fruit extract, carrot extract, licorice extract, orange powder, glycerin, vitamin E, rosemary oil, and Rose water. The formulation was prepared within a skin-compatible pH range of 5.10. The selected herbal ingredients were incorporated for their antioxidant, moisturizing, soothing, skin-brightening, and rejuvenating properties. Aloe vera provided hydration and soothing action, while dragon fruit extract contributed antioxidant activity. Licorice extract was included for depigmenting effect, carrot extract for skin renewal, and orange powder for natural vitamin C activity. Glycerin acted as a humectant, vitamin E as an antioxidant stabilizer, and rosemary oil improved skin conditioning. The prepared formulation was evaluated for physicochemical parameters including appearance, pH, homogeneity, spreadability, stability, and skin irritancy. The formulation showed satisfactory homogeneity, suitable consistency, stable pH, and good spreadability without causing skin irritation. The developed herbal sheet mask demonstrated effective moisturizing and skin-softening properties, indicating its potential as a safe and effective herbal cosmetic formulation.

KEYWORDS: Herbal face sheet mask, Licorice extract, Dragon fruit Extract, Depigmentation, Anti-aging effect.**INTRODUCTION**

"Any plant which has leaves, stem, flowers, roots, and seeds; used for different purposes like flavoring, food, medicine, or perfume" is the definition of a herb. According to botany, a herb is any seed-bearing plant that dies to the ground after flowering or completing its life cycle and lacks a woody stem. Herbs are therefore seasonal plants based on the Oxford Dictionary. "Any plant with leaves, seeds, or flowers used for flavoring, food, medicine, or perfume is a herb". In daily life, plants used as food, spices, and fragrances are also regarded as herbs.^[1,8,11]

Herbal cosmetics are plant-derived ingredients that provide therapeutic and skin-enhancing benefits with few side effects, herbal cosmetics are becoming more and more popular. The current formulation uses natural ingredients like orange powder for vitamin C-mediated brightening, licorice extract for depigmentation, carrot extract for skin renewal, dragon fruit extract for

antioxidant and anti-aging effects, and aloe vera for hydration and soothing. Vitamin E offers antioxidant stability, glycerine functions as a humectant, and rosemary oil gives skin conditioning and a subtle scent. These formulas promote safer, nutrient-rich, and efficient skincare products while avoiding harsh synthetic chemicals.^[9,12]

Herbal face masks, formulated using natural ingredients such as herbs, fruits, and botanicals, offer a gentle and sustainable approach to skincare. They provide benefits including anti-inflammatory effects, hydration, exfoliation, and reduction of hyperpigmentation. However, their formulation presents challenges such as maintaining consistency and stability of raw materials, preventing ingredient incompatibility and degradation, achieving suitable texture, and ensuring safety with low allergenic potential. Recent advancements aim to address these formulation challenges.^[12,13]

Advantages of Herbal Cosmetics

a) Natural Products

Herbal cosmetics are made from natural ingredients obtained from plants. They do not contain harmful synthetic chemicals that can damage the skin. These products include plant extracts and natural nutrients like vitamins and minerals, which help keep the skin healthy, glowing, and smooth.^[9]

b) Safe and Effective

Compared to many chemical-based beauty products, herbal cosmetics are generally safer and effective. They are usually mild on the skin and less likely to cause allergies. Because they are made from natural ingredients, the chances of irritation, rashes, or itching are reduced.^[9]

c) Suitable for All Skin Types

Herbal cosmetics can be used by people with different skin types, such as dry, oily, or sensitive skin. They are gentle and do not usually worsen skin conditions.^[9]

d) Not Tested on Animals

Most herbal cosmetic products are developed without animal testing. They are tested using modern laboratory methods, making them more ethical and cruelty-free.^[9]

e) Fewer Side Effects

Unlike synthetic products, which may cause irritation or long-term skin problems, herbal cosmetics are less likely to harm the skin. They do not contain harmful substances like parabens and are less likely to clog pores or disturb the natural balance of the skin.^[9]

f) Wide Variety

There is a large range of herbal cosmetic products available, including skincare and haircare items, offering many choices to users.^[9]

g) Affordable

Herbal cosmetics are generally cost-effective and easily available, making them accessible to a wide range of people.^[9]

Human Skin

The skin is the largest organ of the human body, covering about 20 square feet. The skin consists of three main layers: the epidermis (outer layer) that provides a protective barrier and determines skin tone, the dermis (middle layer) containing connective tissue, hair follicles, and sweat glands, and the subcutaneous layer (hypodermis), which is made up of fat and connective tissue. Skin color is produced by melanin, which is synthesized by melanocytes in the epidermis.^[7,14]

Functions of Skin^[7]

- It contributes to thermoregulation by liberating sweat, on surface and by adjusting the flow of blood in the dermis.

- It also serves as blood reservoir where dermis house and extensive network of blood vessels that carry 8-10% of total blood in resting adult.
- It serves as medium of sensation, including tactile sensation touch, pressure, vibration and tickling as well as thermal sensation such as warmth and coolness and also sensation of pain
- It excretes sodium chloride and metabolites like urea.
- It also helps in maintaining water and electrolyte balance.
- It helps in synthesis of vitamin d from ergosterol of skin by action of UV rays of sunlight.
- It synthesizes melanin from tyrosine.
- It secretes sweat and sebum which keep the skin soft.
- It stores fat, water, chlorides and sugar

HERBAL FACE SHEET MASK

The ability of sheet masks to hydrate the skin, eliminate excess oil and pollutants, and enhance the appearance of pores has made them popular for skincare. They are inexpensive, readily available, and usually composed of materials like cellulose or microfiber. Natural ingredient-based products are becoming more popular as people become more conscious of environmental issues. Because of their many uses, including antioxidant activity, plant extracts are being used more and more in pharmaceutical and cosmetic products.^[8]

Concept of Beauty in Ayurveda

According to Ayurveda, beauty is not gender-specific but rather a reflection of general health and well-being. Ayurvedic literature has a long history of using herbal remedies for aesthetic purposes. Maharishi Ayurveda states that healthy internal processes like liver activity, blood purity, a balanced body temperature, sufficient hydration, and effective digestion are necessary for glowing skin. Sara (tissue quality), Prakriti (body constitution), Samhanana (body compactness), Pramana (body proportions), Twaka (skin complexion), and Dirghayu Lakshana (signs of longevity) are some of the Ayurvedic criteria used to assess beauty.^[8]

SELECTING THE RIGHT FACE MASK SHEET

A. Anti-Aging Sheet Masks

Combat signs of aging with masks often containing ingredients like collagen and peptides.^[8]

B. Brightening Sheet Masks

Achieve a radiant complexion with brightening sheet masks enriched with ingredients like vitamin.^[8]

C. Hydrating Sheet Masks

If your skin craves moisture, these masks offer a deep hydration boost.^[8]

D. Soothing Sheet Masks

Soothing sheet masks provide relief from redness and irritation.^[8]

E. Acne-Fighting Sheet Mask

Acne-fighting sheet masks commonly contain salicylic acid to reduce breakouts.^[8]

Advantages of Herbal Mask Sheet**A. Deep Cleansing**

Effectively removes dirt, oil, makeup, and hidden impurities from the skin surface and pores.^[8]

B. Impurity Removal & Skin Refreshing

Helps detoxify the skin and provides a relaxing, spa-like effect at home while improving skin appearance.^[8]

C. Unclogs Pores

Absorbs excess oil, removes dead skin cells, and reduces pore blockage, making pores look tighter.^[8]

D. Improves Skin Health

Enhances blood circulation, supports better skin tone, and gives a healthier overall look.^[8]

E. Instant Glow

Provides quick hydration and nourishment, resulting in brighter and smoother skin.^[8]

PLANT PROFILE**1. Dragon Fruit**

General description: Tropical fruit with red/pink peel and white or red pulp rich in antioxidants

Synonyms: Pitaya, Pitahaya

Biological source: Fruit of *Hylocereus undatus*

Family: Cactaceae

Chemical constituents: Betalains → anti-aging,

Geographical source: Mexico, Central America, India.

Uses: Hydration, anti-aging, improves skin radiance

2. Carrot

General description: Root vegetable rich in carotenoids

Synonyms: Daucus carota, Gajar

Biological source: Root of *Daucus carota*

Family: Apiaceae

Chemical constituents

β -carotene → skin repair

Geographical source: Worldwide (India, China, Europe)

Uses: Skin rejuvenation, glow enhancement, anti-wrinkle

3. Licorice Root

General description: Sweet-tasting medicinal root

Synonyms: Mulethi, Yashtimadhu

Biological source: Root of *Glycyrrhiza glabra*

Family: Fabaceae

Chemical constituents: Glabridin → reduces pigmentation

Geographical source: Mediterranean, Asia, India

Uses: Brightening, anti-inflammatory, reduces dark spots

Benefits of Herbal Mask Sheet**I. Hydration**

Provides deep moisture to dry skin, improves elasticity, and makes skin soft and plump.^[8]

II. Detoxification

Removes dirt, oil, sweat, and environmental pollutants, helping to cleanse clogged pores.^[8]

III. Brightening Effect

Reduces dullness caused by pollution and stress, restoring natural glow and improving skin radiance.^[8]

IV. Suitable for All Skin Types

Available in different formulations to meet the needs of oily, dry, and combination skin.^[8]

V. Quick Skin Care Solution

Easy to use and delivers fast visible results like freshness and glow.^[8]



Fig. 1: Dragon fruit.^[31]



Fig. 2: Carrot.^[32]



Fig. 3: Licorice root.^[36]

4. Orange Peel Powder

General description: Dried powdered peel of orange fruit

Synonyms: Citrus peel powder

Biological source: Peel of *Citrus sinensis*

Family: Rutaceae

Chemical constituents: Vitamin C → skin brightening

Geographical source: Worldwide (India, Brazil, USA)



Fig. 4: Orange peel powder.^[33]

5. Aloe Vera

General description: Succulent plant with gel-filled leaves

Synonyms: *Aloe barbadensis*

Biological source: Leaf gel of Aloe vera

Family: Asphodelaceae

Chemical constituents: Aloin → healing

Geographical source: Africa, India, tropical regions

Uses: Moisturizing, soothing, wound healing



Fig. 5: Aloe Vera.

6. Rosemary Oil

General description: Essential oil obtained from aromatic herb

Synonyms: *Rosmarinus officinalis* oil

Biological source: Leaves of *Rosmarinus officinalis*

Family: Lamiaceae

Chemical constituents:

Rosmarinic acid → antioxidant

Geographical source: Mediterranean region

Uses: Antimicrobial, improves skin tone, reduces acne



Fig. 6: Rosemary Oil.^[35]

The primary aim of the present study is to formulate and evaluate a herbal face sheet mask using natural ingredients with proven skin-beneficial properties. The objective is to develop a safe, effective, and cost-efficient cosmetic formulation that provides multiple skin benefits such as hydration, nourishment, antioxidant protection, and improvement in overall skin appearance. The study also focuses on selecting suitable herbal components based on their functional roles, preparing a stable formulation, and evaluating it using appropriate physicochemical and performance parameters. Additionally, the research aims to assess the potential of herbal ingredients as alternatives to synthetic chemicals

in skincare products, thereby enhancing safety and minimizing adverse effects.

MATERIAL AND METHOD

Instrument and its uses

Various type of instrument used in preparation of Herbal Facial sheet Mask listed below

Table 1: List of Instruments.

SR.NO	INSTRUMENTS	USES
1.	Heating mantle	Heating
2.	Weight balance	Weight
3.	pH meter	Measurement of pH

Material and its role/importance

Various ingredients used in the preparation of Herbal Facial Sheet Mask listed below:

R.NO	INGREDIENTS	QUANTITY	ROLE
1.	Dragon fruit extract	8 ml	Anti aging effect
2.	Carrot extract	4ml	Skin rejuvenation
3.	Orange peel powder	2 gm	Tan removal
4.	Licorice extract	0.75 ml	Depigmenting effect
5.	Glycerine	1 ml	Humectant
6.	Vitamin E	0.15 gm	Improve skin barrier
7.	Rosemary oil	1 ml	Skin toning

8.	Rose water	10 ml	Solvent / Perfume
9.	Aloe vera gel	11 ml	Moisturizer
10.	Sodium Benzoate	0.076 gm	Preservative

METHODOLOGY

1. Extraction of Dragon Fruit

- Take required amount of coarse powder of dragon fruit.
- Then soaked in ethanol for 24–48 hours with occasional shaking.

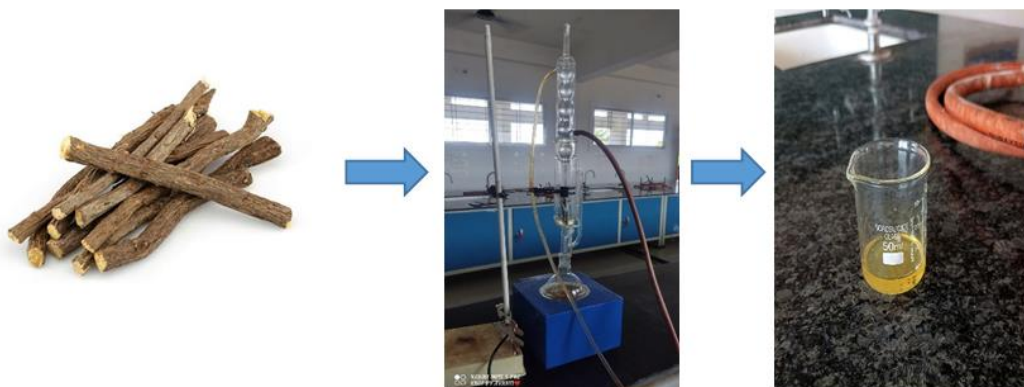
- The extract was filtered using muslin cloth and filter paper.
- The filtrate was concentrated and stored for further use.



2. Extraction of licorice

- Dried licorice roots were powdered and packed in a thimble.
- The thimble was placed in a Soxhlet apparatus containing ethanol as solvent.

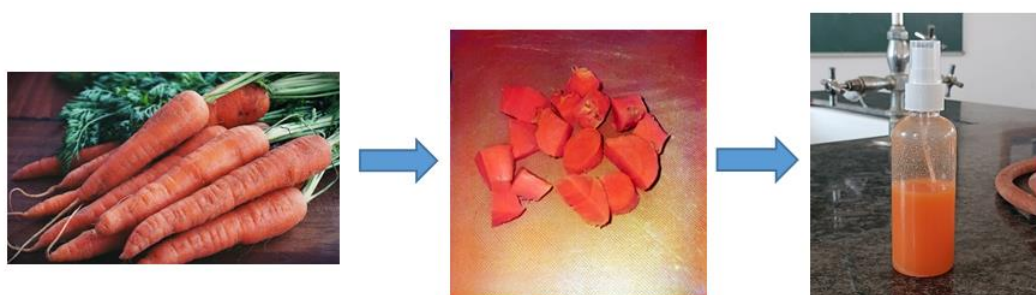
- Continuous heating was carried out for complete extraction.
- The extract obtained was concentrated by evaporating the solvent.
- The final extract was stored in an airtight container.



3. Extraction of carrot

- Take required amount of coarse powder of Carrot.
- Then soaked in ethanol for 24–48 hours with occasional shaking.

- The extract was filtered using muslin cloth and filter paper.
- The filtrate was concentrated and stored for further use.



4. Extraction of Aloe vera gel

- Fresh aloe vera leaves were washed thoroughly with water.
- The thorny edges were removed and the leaf was cut longitudinally.
- The inner transparent gel was collected by scraping.
- The gel was homogenized to obtain smooth consistency.
- The prepared gel was stored in a clean airtight container.

**5. Procedure of herbal face sheet mask****(A) Mixture of A**

Take dragon fruit extract, licorice extract, and carrot extract into a beaker, licorice extract and carrot extract into the beaker.

(B) Mixture of B

Weigh all ingredients (Aloe-vera gel, Rosemary oil, Glycerin, Vitamin-E) and mix them in a beaker.

- Pour the mixture B into mixture A very slowly and mix it well to make the serum.
- Then dip a mask sheet into serum.
- Pack a face mask sheet in the air tight aluminium sachet with label
- Herbal face mask sheet was ready to apply.

**Mixture A****Mixture B****Mix both mixtures A&B****Dip mask into serum, pack & label**

EVALUATION PARAMETERS

1. Organoleptic property

The organoleptic test is carried out to see the physical appearance of the essence by observing changes in the shape, smell and colour of the essence that has been made before and during cycling test.^[8]



Fig. 7: Serum.

2. pH determination

Determination of the pH of preparation is done by using a pH meter. The pH test was carried out before and during cycling test.^[8]



Fig. 8: pH of serum.

3. Irritability

A small amount of serum was applied on the skin and kept it for few minutes and found to be non-irritated.^[8]



Fig. 9: After Applied Serum.

4. Determination of Homogeneity

This test was carried out using 2 object glass, 2-3 drops of the preparation are smeared on a piece of object glass covered by another glass. The preparation must show a homogeneous arrangement and no coarse grains are visible. This homogeneity test was carried out before and during cycling test.^[8]



Fig. 10: Homogeneity of serum.

5. Spreadability test

The Spreadability of serum is crucial for its behavior on the skin. A small sample was placed on a watch glass, and another glass was placed above it.^[8]

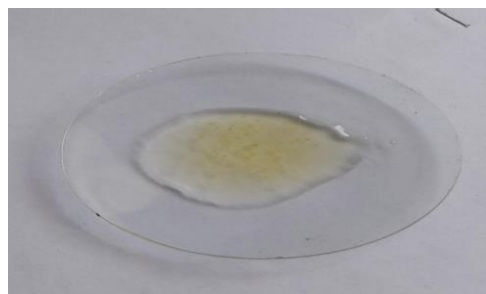


Fig. 11: Spreadability of serum.

RESULT AND DISCUSSION

The prepared herbal sheet face mask was evaluated for parameters including appearance, colour, odour, pH, consistency, spreadability, irritancy, and homogeneity. The formulation showed satisfactory characteristics in all tests, indicating its suitability and effectiveness for cosmetic application.

SR.NO	PARAMETER	FORMULATION
31.	Colour	Yellowish
2.	Odour	Aroma
3.	Consistency	Liquid
4.	pH	5.10
5.	Irritability	Non-irritant
6.	Homogeneity	Good

SUMMARY AND CONCLUSION

This study focused on the formulation and evaluation of a herbal sheet mask using plant-based ingredients with multifunctional skin benefits. The formulation incorporated aloe vera, dragon fruit extract, licorice

extract, carrot extract, and orange powder, supported by glycerine, vitamin E, rosemary oil, and Rose water. These ingredients were selected for their combined antioxidant, depigmenting, moisturizing, and anti-aging properties.

The prepared formulation was evaluated for key physicochemical parameters including pH, homogeneity, spreadability, and appearance, along with stability and skin irritation assessment. The results indicated that the formulation possessed suitable pH (5.10), good consistency, and uniformity. Stability studies showed no significant changes, and patch testing confirmed the formulation to be non-irritant. The sheet mask demonstrated effective hydration and improved skin texture upon application, supporting its functional performance as a topical cosmetic product.

The developed herbal sheet mask formulation proved to be stable, safe, and effective for topical application. Its composition of natural bioactive ingredients offers significant benefits such as skin hydration, depigmentation, and antioxidant protection, making it a promising alternative to synthetic cosmetic products. However, the current findings are limited to preliminary evaluation; therefore, extensive clinical studies and long-term stability assessments are required to substantiate its efficacy and support large-scale commercialization.

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31. Picture of dragon fruit -
<https://share.google/t2ARodTTx8yz4Ezt8>
32. Picture of Carrot -
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33. Picture of orange peel powder -
<https://share.google/x8BdKING1hCBviPKK>
34. Picture of aloe -
<https://share.google/Pr77q7CCZrRA92Skc>
35. Picture of rosemary oil -
<https://share.google/fgUr6Mfr05wYet3eg>
36. Picture of Licorice root -
<https://share.google/25qfv8ztLSIXCVCat>

Herbal Shampoo: Formulation and Evaluation Study

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ABSTRACT

The present study focuses on the formulation and evaluation of a herbal shampoo as a potential alternative to synthetic hair care products associated with adverse effects. The formulation was developed to achieve effective cleansing, moisturizing, and strengthening properties while minimizing the use of harsh chemicals. Optimization of surfactants, thickeners, and herbal extracts was carried out to attain desired viscosity and stability. Herbal ingredients such as Neem (*Azadirachta indica*), Shikakai (*Acacia concinna*), and Reetha (*Sapindus mukorossi*) were selected based on their well-established therapeutic properties. These ingredients function as natural surfactants and possess antimicrobial and anti-dandruff activities. Additionally, they are rich in bioactive constituents including alkaloids, flavonoids, saponins, and polyphenols, which contribute to improved scalp health and hair nourishment. The prepared formulation was evaluated for organoleptic characteristics, physicochemical parameters, and performance tests such as pH, viscosity, foam stability, surface tension, dirt dispersion, and wetting time. The results demonstrated satisfactory performance, stability, and safety for scalp application. The study concludes that the developed herbal shampoo offers an effective, safe, and environmentally sustainable alternative for modern hair care needs.

Keywords: Herbal shampoo, Neem, Shikakai, Reetha, Antidandruff.

I. INTRODUCTION

Shampoo is a liquid or cream preparation of soap or detergent used for washing hair. It is a hair care product generally available in viscous liquid form and is designed to cleanse the hair and scalp effectively. The primary purpose of shampoo is to remove dirt, excess oil (sebum), dandruff, environmental pollutants, and residues of hairstyling products without eliminating excessive

natural oil that keeps the hair soft and manageable. Shampooing is most common method of maintaining hair hygiene [1].

Hair is an important protective appendage of the body derived from the ectoderm of the skin and is considered an accessory structure of the integumentary system along with sebaceous glands, sweat glands [2]. Sebaceous glands produce sebum, which helps maintain the natural shine and smoothness of hair. Proper cleansing is necessary to prevent the accumulation of impurities on the scalp. Hair care products are formulated to clean, nourish, and improve the overall appearance of hair [3]. However, modern shampoos are multifunctional and provide additional benefit such as conditioning, smoothness, and improved manageability, leaving hair shiny and easy to comb. Many synthetic shampoos are present in the current market, both medicated and non-medicated; however, herbal shampoo popularized due to natural origin which is safer, increases consumer demand and free from side effects [4].

In synthetic shampoos, surfactants are added mainly for their cleansing and foaming properties, but the continuous use of these surfactants may lead to adverse effects such as eye irritation, scalp irritation, hair loss, and dryness of hair [5]. As an alternative to synthetic shampoos, formulations containing natural herbal ingredients can be used. However, formulating cosmetic products using only natural substances is very difficult [6].

A number of medicinal plants with beneficial effects on hair have been traditionally used worldwide and are incorporated into shampoo formulations [7]. Ingredients like reetha, shikakai, neem. These medicinal plants may be used in the form of extracts, powders, crude forms, or their derivatives [8].

Developing a shampoo containing only one natural substance that is safe and mild, while also providing good foaming, detergency, and solid content comparable to synthetic shampoos, is quite

challenging. Therefore, an attempt has been made to develop a herbal-based shampoo using conventional techniques and commonly used plant materials for hair cleansing [9].

Ideal Characteristics of Herbal Shampoo

1. It should remove loose corneal cells from the hair, excess sebum or other fatty substances, and dust or debris thoroughly and effectively.
2. It should generate a sufficient amount of foam to meet the user's psychological needs.
3. When you rinse it with water, it ought to come off with ease.
4. The hair should be left with minimal fly away, soft, glossy, and manageable texture.
5. It ought to give the hair a pleasing fragrance.
6. It shouldn't irritate the skin or eyes or have any negative consequences.
7. The hand shouldn't get rough and chapped as a result. [10]

Functions of Shampoo

1. It should effectively and completely remove dirt or soil.
2. It should effectively wash the hair.
3. It should produce a good amount of foam to satisfy the user.
4. It should be readily removed by rinsing with water.
5. It should impart a pleasant fragrance to the hair.
6. It should not have any side effects or causes irritation to the skin and eye.

Classification of Shampoo

1. Based on Appearance
 - Powder shampoo
 - Liquid shampoo or lotion shampoo
 - Gel shampoo or Solid shampoo
 - Cream shampoo
 - Oil shampoo
 - Miscellaneous anti dandruff shampoo or medicated shampoo
2. Based on Use or Function
 - Conditioning shampoo
 - Antidandruff shampoo
 - Therapeutic shampoo
 - Baby shampoo
 - Balancing shampoo
 - Clarifying shampoo
3. Based on origin
 - Herbal shampoo
 - Egg shampoo [11]

Anatomy of Hair

Hair is composed of 95% keratin, a fibrous, helicoidal protein (formed like a helix) found in the skin and all of its attachments (body hair, nails, and so on). The hair structure consists of 3 different parts:

Medulla: It is the innermost layer of the hair shaft, composed of amorphous, soft, and greasy substances.

Cuticle: A thin protective outer layer that contains nutrients that promote hair development. It is highly keratinized, with cells structured like scales placed one on top of the other, measuring approximately 60 micrometers long and 6 micrometers wide.

Cortex: The major component of the hair, containing long keratin chains that provide elasticity, suppleness, and resistance to the hair. The cortex's cells are linked together by a lipid and protein-rich intercellular cement. [12].

Growth cycle of hair

Hair growth cycle consists of four phases:

Anagen (growth phase): It is the growing phase. This phase lasts for several years.

Catagen (transitional phase): During this phase the hair follicle shrinks and hair growth slows.

Telogen (resting phase): It is the resting phase where hair growth stops and new hair begins the growth phase, pushing the old hair out.

Exogen phase: last phase of hair growth cycle where hair strand completely detaches from the scalp and sheds off. [13]

Hair problem:

Hair loss: Hair loss is caused by a variety of circumstances, Including stress, hormonal imbalance, and the use of the improper products. Prevention can be achieved by eating protein-rich foods, switching to mild shampoos, massaging with heated oil, staying hydrated, and exercising regularly.

Dandruff: Dandruff is the scaly particles that stick to the hair's root and are caused by a bad diet, a dry scalp, an infection, excess sebum, or sensitivity to particular products.

Split ends: When the oil from the scalp does not reach the ends of the hair, causing it to dry and split over time. Another cause is heat, which exacerbates the ends. Applying a little oil to the ends might help prevent split ends.

Oily scalp: Oily scalp can be caused by a variety of factors, including a bad diet, heredity, or hormonal fluctuations, but the most common culprit is frequent washing. Lactic acid is an ingredient that helps to regulate oil production. Inflammatory skin

disorder that affects the scalp and can cause hair loss[14].

Advantages of Herbal Shampoo

1. Easy to manufacture and cheap in cost.
2. Easily available and found in large variety and quantity.
3. They did not provoke allergic reaction and do not have negative side effects.
4. Easily incorporate in skin and hair.

Plant profile

1. Reetha

Synonym: Indian soapberry, Washnut

Biological source: *Sapindus mukorossi*,
family: Sapindaceae

Chemical constituents: Triterpenoidsaponins, sapindoside A & B, sugar, tannins

Uses:

- Cleanser insecticide.
- For treating migraine headaches.
- To remove skin impurities like pimples or eczema.

2. Shikakai

Synonyms: Soap Pod, Saptala (Sanskrit)

Biological Source: It is derived from the dried fruit pods, leaves, and bark of *Acacia concinna*.

Family: Leguminosae (Fabaceae).

Chemical Constituents: Saponins, spinasterol, lactonenatural sugars, hexacosanol, oxalic acid, tartaric acid, citric acid, ascorbic acid, alkaloids, and nicotine

Use:

- Act as natural hair cleanser, astringent.
- Act as natural detangle hairs.

3. Neem

Synonyms: Azadirachta indica, MargosaNimtree

Biological Source: It consists of almost all aerial parts (leaves, bark, seeds, flowers) of the plant *Azadirachta indica* Linn.

Family: Mellaceae.

Chemical Constituents: Azadirachtin, nimbin, quercetin, salannins

Uses:

- To treat dandruff.
 - Reduce scalp itchiness/inflammation.
 - Promote hair growth due to its antifungal and antibacterial properties. [15].
- The present study aims to formulate and evaluate a herbal shampoo. The objective of the study is to develop a formulation that provides efficient cleansing, good foaming ability, and desirable viscosity while maintaining the natural integrity of hair and scalp. It also focuses on incorporating

herbal extracts such as reetha, shikakai, and neem, which are known for their cleansing, conditioning, and antimicrobial properties. Furthermore, the study seeks to evaluate various physicochemical parameters including pH, viscosity, foam stability, surface tension, and overall stability of the prepared formulations. Another objective is to assess the performance, safety, and user acceptability of the herbal shampoo, ensuring it minimizes side effects commonly associated with synthetic products and promotes healthy, strong, and shiny hair.

II. MATERIAL AND METHOD

Plant materials such as reetha (*Sapindus mukorossi*), shikakai (*Acacia concinna*), and neem (*Azadirachta indica*) were procured from the local market of Talegaon, District-Wardha (India). These materials were thoroughly washed with distilled water to remove impurities and then shade-dried to preserve their active constituents. The dried materials were further subjected to pulverization, followed by extraction processes such as maceration to obtain the required extracts.

Excipients including hydroxyl propyl methyl cellulose (HPMC) as a thickening agent, sodium lauryl sulfate (SLS) as a surfactant, and sodium benzoate as a preservative were used in the formulation. Ethanol (purity $\geq 99\%$) was utilized for extraction purposes. All the ingredients were of analytical grade and procured from standard chemical suppliers. Double-distilled water prepared in the laboratory was used throughout the formulation process to maintain purity and consistency of the herbal shampoo.

Extraction of plant material

- Reetha shells, shikakai pods, and neem leaves were collected and washed thoroughly with distilled water to remove impurities.
- The materials were shade dried and coarsely powdered using a grinder.
- A mixture of distilled water and ethanol (70:30) was prepared to enhance extraction of both water-soluble and alcohol-soluble constituents.
- The powdered material was soaked in the hydroalcoholic solvent in a closed container.
- The mixture was kept for 48 hours with occasional stirring to ensure proper extraction.
- After maceration, the mixture was filtered using muslin cloth or filter paper to remove solid residues.
- The filtrate was subjected to mild heating (40-60°C) to evaporate excess solvent and obtain a concentrated extract.

- The extract was cooled and stored in an airtight container for further use in shampoo formulation.

Formulation Process

Table1: Formulation of herbal shampoo batches by *trial and error* method

Batches	F1	F2	F3	F4	F5
Ingredients (g)					
HPMC	1.5	1.5	1.5	1.5	1.5
SLS	2.0	3.0	2.0	2.0	1.0
Reetha extract	6.0	6.0	8.0	6.0	7.0
Shikakai extract	6.0	6.0	8.0	6.0	7.0
Neem extract	3.0	3.0	4.0	5.0	3.0
Glycerin	3.0	3.0	3.0	3.0	4.0
Sodium benzoate	0.3	0.3	0.3	0.3	0.3
Citric acid (q.s.)	q.s.	q.s.	q.s.	q.s.	q.s.
Distilled water	q.s. to 100g	q.s. to 100g	q.s. to 100g	q.s. to 100g	q.s. to 100g

Method of Preparation for Herbal Shampoo (F1-F5)

All five formulations (F1-F5) were prepared using the same method, with variations only in the composition as specified in the formulation table. Accurately weighed quantity of hydroxypropyl methylcellulose (HPMC, 1.5 g) was dispersed in approximately 50 g of hot distilled water (70-80°C) with continuous stirring. The dispersion was allowed to hydrate and cool to room temperature to form a clear and uniform gel base.

Separately, the required quantity of sodium lauryl sulfate (SLS) was dissolved in a small amount of lukewarm distilled water. This SLS solution was then slowly incorporated into the HPMC gel with gentle stirring to minimize foam formation.

Subsequently, the specified quantities of reetha extract, shikakai extract, and neem extract were added sequentially to the base with continuous mild stirring to ensure uniform distribution.

Glycerin was then incorporated as a humectant and mixed thoroughly. The preservative, sodium benzoate, was pre-dissolved in a small quantity of warm water and added to the formulation at a temperature below 40°C with gentle stirring.

The pH of the formulation was adjusted to 5.5-6.0 using citric acid solution (q.s.). Finally, the volume was made up to 100 g using distilled water and mixed uniformly.

Evolution Parameters

1. Physical appearance

The physical appearance of a shampoo should be enticing, its color, odor, and transparency can all be assessed.

2. pH Determination

A shampoo's performance, stability, and suitability for the hair and scalp are all impacted by its pH. A shampoo's Ideal pH range is normally between 4.5 and 6.5.

3. Viscosity determination

Once rheological factor that influences a shampoo's thickness and flow characteristics is viscosity. It also impacts how well the shampoo cleans and how the user feels about it.

4. Foaming ability and foam stability

Cylinder shake method was used for determining foaming ability. 50ml of the 1% herbal shampoo solution was put into a 250ml graduated cylinder and the cylinder was covered with hands and shaken for 10 minutes. The total volume of the foam content after 1min shaking was recorded. Immediately after shaking the volume of the foam at 1min intervals for 10 minutes were recorded. The foam volume remains same throughout the period of about 5min showing that the generated foam by the shampoo has good stability and the prepared shampoo exhibits higher foam property which may be due to the presence of soapnut. 1ml shampoo is dissolved with 2ml water and shaken vigorously for 10 minutes produced 0.4ml foam.

5. Dirt dispersion

Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and

shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy.

6. Surface Tension

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water because surface tension is highly affected with grease or other lubricants and after cleaning determine the surface tension.

7. Wetting time test

The concentration of a surfactant determines how well it wets. A quick and accurate test to determine a shampoo's wetting ability is the canvas disc method. A longer wetting time means there are less detergents in the shampoo.

8. Stability studies

During the storage period, the formulations organoleptic qualities (color and odor) showed stability and acceptability, indicating their physical and chemical stability [16,17].

Table 2: Optimize formulation of herbal shampoo

Sr. no.	Ingredients	Quantity(g)
1	HPMC	1.5
2	SLS	2.0
3	Reetha extract	8.0
4	Shikakai extract	8.0
5	Neem extract	4.0
6	Glycerin	3.0
7	Sodium benzoate	0.3
8	Citric acid (q.s.)	q.s.
9	Distilled water	q.s. to 100g



Fig. 1: Optimized herbal shampoo

III. RESULT AND DISCUSSION

After preparation of the herbal shampoo using selected plant extracts such as reetha, shikakai, and

neem, the formulated batches were evaluated for various physicochemical parameters. The percentage yield of the extracts was found to be satisfactory, indicating efficient extraction of active constituents.

Among all batches, one optimized formulation showed comparatively better results in terms of viscosity, foam stability, and overall performance. The detailed results of evaluation parameters are presented in tabulated below (table).

1. Physical Appearance

The prepared formulations (F1–F5) were visually inspected for color, clarity, odor, and consistency. All batches showed a brown to dark brown color with a characteristic herbal odour.

Table1.3:Physical appearance

Batch	Colour	Odor	Consistency	Homogeneity
F1	Brown	Pleasant	Slightly viscous	Good
F2	Dark brown	Strong unpleasant	Highly viscous	Good
F3	Dark brown	Slight pleasant	Moderately viscous	Excellent
F4	Brown	Slight pleasant	Thin	Good
F5	Brown	Mild pleasant	Thin	Moderate

2. pH Determination

The pH of all formulations was found in the range of 4.5–6.5, which is suitable for scalp and indicates that the shampoo is mild and non-irritant.

3. Viscosity

The viscosity of F3 formulation found to be optimum than other batches, without being too thick or too thin. According to the observation table (1.4).

4. Foam Ability and Stability

The foam height and foam stability of all formulation are presented in table (1.4). It was observed that the F3 produce comparatively higher foam and showed good foaming stability than other formulation indicating effective cleansing performance.

5. Dirt Dispersion Test

According to the observation table (1.4). F3 formulation showed minimal dirt in foam, indicating good cleansing ability and efficient removal of dirt and oil.

6. Surface Tension Test

The surface tension value of all formulation are show in table (1.4) it was found that the F3 formulation show surface tension reaching the acceptable range, indicating good cleansing efficiency.

7. Wetting Time Test

According to the observation table (1.4). F3 formulation showed slightly lower wetting time compared to others, indicating better wetting ability.

Table 1.4: Evaluation of prepare formulation batches

Parameter	F1	F2	F3	F4	F5
pH	5.5	5	5.5	5	5
Viscosity	1.92	2.20	2.60	2.06	1.78
Foam height(mm)	10	20	22	15	18
Foam stability(min)	10	10	12	10	9
Dirt dispersion	Good	Moderate	Excellent	Good	Good
Surface tension	31	32	34	31	30
Wetting time(sec)	190	220	110	150	195

8. Stability Studies

All formulations were found to be stable during the study period with no significant changes in color, odor, or consistency.

As a result, it can be concluded that the F3 formulation is suitable for effective application as a herbal shampoo.

IV. SUMMARY AND CONCLUSION

The present study focused on the formulation and evaluation of a herbal shampoo

using natural ingredients such as reetha, shikakai, and neem. These plant materials were selected due to their well-known cleansing, antimicrobial, and hair-nourishing properties. The extracts were prepared using the maceration process with suitable solvents like water and ethanol to obtain active constituents. A total of five different formulations (F1-F5) were prepared by varying the concentration of ingredients such as SLS and herbal extracts, while maintaining HPMC as a thickening agent and sodium benzoate as a preservative. Each

formulation was evaluated for various physicochemical parameters including pH, viscosity, foam stability, homogeneity, and cleansing ability. The evaluation results showed that F-3 batch formulation possessed acceptable characteristics, with slight variations depending on composition. Among them, one optimized formulation showed better performance in terms of foam stability, viscosity, and good cleansing action.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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FORMULATION AND EVALUATION OF HERBAL SCRUB**Yogita M. Talmale*, Snehal V. Salve, Suyog N. Ghatol, Tanuja N. Agole, Vaishnavi D. Kadu**

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ABSTRACT

The primary aim of the present study was to formulate a polyherbal face scrub. Facial skin is continuously exposed to dirt, pollution, dust particles, and accumulates a large number of dead cells. To eliminate these dead cells and maintain the skin in a healthy, clean, and nourished condition, some suitable facial preparations are required. The formulated scrub contains various natural ingredients that are safer to use, produce fewer side effects, and exhibit properties such as antiseptic, anti-infective, antioxidant, anti-aging, and humectant effects. The scrub was prepared by a simple mixing method using ingredients like Beal fruit powder, Orange peel extract, Moringa extract, Neem powder, Turmeric powder into Carbopol 934. Additional components, including Apricot oil, triethanolamine, preservatives, and a perfuming agent, were also added with uniform mixing to obtain a homogeneous formulation. The prepared scrub was evaluated for several parameters such as physical appearance, color, texture, odor, pH, consistency, irritability, washability, extrudability and spreadability. It showed satisfactory results for all the tested parameters. Therefore, the formulated scrub can be effectively used as it demonstrates good scrubbing properties and helps in achieving healthy, clean, and glowing skin.

KEYWORDS: Herbal scrub, anti-aging, Beal fruit, Spreadability.**INTRODUCTION**

The skin is one of the largest organs of the human body and plays a vital role as a protective barrier for internal structures. It acts like a shield, safeguarding the body from environmental factors such as sunlight, wind, pollution, and harmful microorganisms.^[1,2] The skin also maintains its own ecosystem of microbes, including bacteria and yeast, which cannot be completely removed through cleaning. In addition, it serves as a sensory organ and reflects an individual's overall health. Structurally, the skin contains components like amino acids, lipids, and carbohydrates, and therefore requires proper nutrition to remain healthy, clear, and radiant.^[3,4] Cosmetics are products used for cleansing, enhancing beauty, and improving appearance.^[5] Since ancient times, herbal ingredients have been widely used for skin care and beautification. The face, being the most visible part of the body, often indicates a person's health status.^[6] Proper skin care is essential to maintain freshness and vitality. Although many commercial products are available, skin care lies at the intersection of cosmetology and dermatology, and does not always require medical supervision.^[7] Herbal exfoliants play an important role in

maintaining healthy skin by removing dead skin cells and promoting the growth of new cells beneath the surface.^[8] As aging occurs, the natural process of cell turnover slows down, leading to the accumulation of dead cells on the skin, which can cause dullness and highlight fine lines.^[9] Regular cleansing is necessary to remove dirt, sebum, dead cells, and cosmetic residues. Exfoliation using herbal scrubs enriched with vitamins, antioxidants, antiseptic, and anti-aging properties helps in deep cleansing, improves skin texture, and enhances its natural glow and attractiveness.^[10] **Aim:** To formulate and evaluate a herbal scrub using natural ingredients such as bael fruit, orange peel, moringa, apricot oil, neem, turmeric.

OBJECTIVES

To formulate a polyherbal scrub, to evaluate its physicochemical properties, to assess its skin compatibility and safety.

Benefits of scrubbing your skin

- For A Squeaky Spotless Skin: Scrubbing gives you clear skin, free from dirt, oil, and sweat.

- Helps In Removing Dead Cells
- Adds Glow to Skin
- Removes Dark Patches.
- Removes Acne Scars
- Prevents Ingrown Hair
- For Smooth Skin
- Improve the Smoothness of Your Skin.
- Promotes Clear Complexion.

Ideal features of a face scrub^[11]

- ☐ It must be non-toxic, mildly abrasive as well as non-sticky.
- ☐ Dead skin cells and grime must be removed.
- ☐ It must be non-irritating.
- ☐ It must have minute grit in it.

ADVANTAGES OF FACE SCRUB

- Promotes healthy, glowing skin, minimizes pores, reduces breakouts and acne, and helps in reducing the appearance of wrinkles.
- Enhances the absorption of skincare products, improves tanning results, and helps maintain the skin's natural pH balance.
- Scrubbing involves the removal of dry or dead skin cells from the surface and is an essential step in a proper skincare routine.
- It not only addresses various skin concerns but also boosts blood circulation, which contributes to healthy and radiant skin.
- Abrasive scrub cleansers are commonly used for mechanical exfoliation of the skin.

DISADVANTAGES OF SCRUB

- Excessive or harsh scrubbing, along with the use of strong chemical-based scrubs, can lead to skin irritation such as redness and inflammation. Individuals with sensitive skin may also experience allergic reactions due to the chemicals present in synthetic scrubs.
- Over-exfoliation can cause pores to open, making the skin more exposed to pollution and harmful UV rays. This can increase the risk of infections and lead to tanning.

Plant Profile

1. Beal fruit



Fig. 1: Beal fruit.

- a] Synonyms: Bael, Stone apple
- b] Biological Source: It consists of dried fruit pulp of

Aegle marmelos Family: Rutaceae c] Chemical Components: Tannins, Marmelosin, Coumarins, Alkaloids, Pectin, Essential oils

- d] Description: Yellowish-brown coloured powder, Characteristic aromatic odour, Slightly bitter and astringent taste
- e] Uses: Used in herbal cosmetics (like scrubs), Helps in skin cleansing and exfoliation

2. Moringa leaf



Fig 2: Moringa leaf.

- a] Synonyms: Drumstick tree leaf
- b] Biological Source: Leaves of *Moringa oleifera* Family: Moringaceae
- c] Chemical Components: Minerals (Calcium, Iron, Potassium), Flavonoids, Polyphenols, Proteins & amino acids
- d] Description: Green coloured fine powder, Mild characteristic odour, Slightly bitter taste
- e] Uses: Antioxidant, Used in herbal cosmetics (face packs, scrubs), Promotes healthy skin & hair

3. Orange peel powder



Fig. 3: Orange peel powder.

- a] Synonym: orange zest
- b] Biological source: *citrus reticulata* in the Rutaceae family c] Synopsis Colour: orange-red; Aromatic taste
- d] chemical components: flavonoids, carotenoids, and terpenes
- e] Uses: Treat acne and pimples, lessen skin blotches.

4. Turmeric powder



Fig. 4: Turmeric powder.

- a] Synonym: *Curcuma longa*
- b] Biological source: of the substance is the dried rhizomes of *Curcuma longa*, which is a member of the Zingiberaceae family.
- c] Description: Yellow in colour, Aromatic Taste, Bitter Odor
- d] chemical components: include curcumin and curcuminoid.
- e] Use: Minimize acne; Brighten skin; Lighten skin.

5. Neem powder



Fig. 5: Neem powder.

- a] Synonym: -Neem
- b] Biological source: *Azardicta indica*. Meliaceae family.
- c] Characteristics: - Green hue, pungent taste
- d] Chemical components: Quercetin, Nimbidin, and Nimbinin.
- e] Uses: Skin toner, brightens dark spots on the skin, Take out the blackheads.

6. Apricot oil



Fig. 6: Apricot oil.

- a] Synonyms: Apricot kernel oil, Prunus oil
- b] Biological Source: It is obtained from kernels (seeds) of *Prunus armeniaca*
- Family: Rosaceae
- c] Chemical Components: Oleic acid, Linoleic acid, Palmitic acid, Vitamin E (tocopherol)
- d] Description: Pale yellow coloured oil, Light texture, non-greasy, Mild pleasant odour
- e] Uses: Excellent skin moisturizer, Nourishes dry & sensitive skin.

MATERIALS AND METHODS

A. Collection of Bael fruit powder

Bael fruit were Collected from farm. The bael were washed well using tap water. The peel is separated, then the pulp of orange was separated and then it was dried in shade for a period of 3-4 days. The dried samples were grinded properly grinder to obtain the coarse powdered form. Passed through sieve no 60.

B. Collection of Neem leaves powder

Fresh neem leaves were collected from college campus. Fresh neem leaves were dried in shade for 4-5 days These leaves are grinded properly using mixture to obtain and pass through sieve no. 60.

C. Collection of Turmeric powder

Fresh turmeric were collected from market. They were dried in shade for 3-5 days. Then grinded properly to form powder. Then Pass through sieve no. 60.

D. Collection of Apricot oil

Apricot oil is purchase from market.

E. Collection of orange peel

Orange fruit were Collected from farm. The orange were washed well using tap water. The peel is separated, then it was dried in shade for a period of 3-4 days. The dried peels were grinded properly grinder to obtain the coarse powdered form.

• Extraction of orange peel:

The extraction o from orange peel is most commonly carried out by Soxhlet apparatus. In this process, fresh or dried peels of *Citrus sinensis* are first washed, cut into small pieces, and dry. Dry orange peel is crushed in mortar and pestle. Powder is passed through sieve no 24 The weight 60 g of powder and 350 ml ethanol is then placed in a Soxhlet apparatus and the mixture is heated for 6-9 hrs.^[12]



Fig. 7: Extraction of orange peel.

F. Collection of moringa leaf

Moringa leaf were Collected from farm. The moringa were washed well using tap water. then it was dried in shade for a period of 4-5 days. The dried leaf were grinded properly to obtain the coarse powdered form.

• Maceration of moringa leaf

The leaves were first dried and then ground into a fine powder. A 60 g powder of this powdered material was soaked in 280 mL of 70% ethanol and left to macerate for 48 hours with occasional shaking. After extraction, the mixture was filtered using Whatman No. 1 filter paper to obtain the filtrate. This filtrate was then concentrated using a rotary evaporator at 40 °C. The resulting crude extract was stored in a refrigerator at 4 °C until it was

needed for further use.^[13]



Fig. 8: Maceration of moringa leaf.

FORMULATION TABLE OF HERBAL SCRUB

Table no. 1: Formulation of herbal scrub batches.

Sr. no.	Ingredients	Formulation 1 Qty. (30g)	Formulation 2 Qty. (30g)	Formulation 3 Qty. (30g)	Formulation 4 Qty. (30g)
1.	Bael fruit (powder)	4%	5%	6%	7%
2.	Orange peel (extract)	1.4%	1.8%	2.2%	2.6%
3.	Moringa leaf (extract)	0.01%	0.05%	0.1%	0.15%
4.	Neem leaf (powder)	0.3%	0.3%	0.3%	0.3%
5.	Turmeric	0.2%	0.2%	0.2%	0.2%
6.	Apricot oil	1%	1%	1%	1%
7.	Carbopol 934	1%	1%	1%	1%
8.	Propylene glycol	q. s.	q. s.	q. s.	q. s.
9.	Triethanolamine	q. s.	q. s.	q. s.	q. s.
10.	propyl paraben	0.02%	0.02%	0.02%	0.02%
11.	Sodium Lauryl Sulphate	4%	4.5%	4%	4.5%

A) Preparation of gel

Propyl paraben was accurately weighed and dissolved in a beaker containing water. Required quantity of Carbopol 934 was added in a beaker then add Triethanolamine or propylene glycol and stirred continuously until a gel was formed. And then add sodium lauryl sulphate weight and dissolve separately with water.



Fig. 9: Gel base.

3. Additional ingredients such as turmeric, moringa extract, orange peel extract and Apricot oil are incorporated as required.
4. The formulation is mixed thoroughly to obtain a homogeneous consistency.
5. The final prepared scrub is then transferred into suitable containers for storage.^[14,15]



Fig. 10: Herbal scrub.

B) Formulation of herbal scrub

1. After the gel base is formed, add exfoliating particles (e.g., finely ground bael fruit powder) are added gradually.
2. Gentle stirring is carried out to ensure uniform distribution of particles without disturbing the gel structure.

Evaluation Parameters

The prepared gel was evaluated for appearance, pH, consistency, Spreadability, extrudability, viscosity, irritability, washability, grittiness, foamability.^[16,17]

RESULTS AND DISCUSSION

1. Organoleptic Evaluation:

a) Appearance

The prepared scrub was evaluated for its odour and colour. The colour was found to be brown in colour and odour was found to be characteristic.

b) Consistency

It was found to be semisolid and homogeneity with visual observation.

2. Physical assessment

a. Determination of pH

The pH of different formulations was determined using a digital pH meter. 1 g of gel was dispersed in 100ml distilled water and the pH was recorded.



Fig. 11: pH meter.

b. Determination of Viscosity

The viscosity of the prepared scrub was measured using a Brookfield viscometer at suitable rpm (e.g., 10 rpm), and the corresponding dial reading was noted.

c. Spreadability

Spreadability is an important property that determines how easily the gel spreads on the skin. A small amount of the sample was placed on a glass slide, and another slide was placed on top. A weight of 100 g was applied, and the time required for the gel to spread was recorded. The gel spread up to 4 cm in 60 seconds. Spreadability was

calculated using the formula: $S = (m \times l) / t$ where S = spreadability, m = weight applied, l = length of the slide, and t = time in seconds.



Fig. 12: Spreadability.

d. Extrudability

A small quantity of gel was filled into a collapsible tube. One end was sealed while the other remained open. Gentle pressure was applied, and the amount of gel extruded along with the time required for extrusion was recorded.

e. Irritability

A small amount of the gel was applied to the skin and left for a few minutes. No signs of irritation were observed, indicating that the formulation is non-irritant.

f. Washability

The gel was applied to the skin and then washed off with water. It was found to be easily washable.

g. Grittiness

The scrub was observed to contain a small number of gritty particles.

h. Foamability

Small amount of scrub was shaken with water in a graduated measuring cylinder and foam was measured.

Table no. 2: Evaluation table.

Sr No.	Test parameter	Formulation 1	Formulation 2	Formulation 3	Formulation 4
1.	Colour	Dark green	Brownish green	Peanut brown	Brown
2.	Odour	Characteristic	Characteristic	Characteristic	Characteristic
3.	Consistency	Sticky	Thick	Good	Good
4.	PH	6.46	6.43	6.64	6.65
5.	Viscosity	5968cps	5950cps	6960cps	7091cps
6.	Spreadability	6.8 g.cm/sec	7 g.cm/sec	7 g.cm/sec	7.2 g.cm/sec
7.	Irritability	Non-Irritant	Non-Irritant	Non-Irritant	Non-Irritant
8.	Washability	Washable	Washable	Easily Washable	Easily Washable
9.	Extruability	Easily Extruded	Easily Extruded	Easily Extruded	Easily Extruded
10.	Grittiness	Low Grittiness	Mild Grittiness	Medium Grittiness	High Grittiness
11.	Foamability	Good	Good	Good	Good

The formulated herbal scrubs (F1, F2, F3 and F4) were evaluated for various physicochemical and sensory

parameters including colour, odour, texture, consistency, spreadability, washability, pH, and grittiness. The results

indicate that all formulations possessed acceptable characteristics due to the use of natural herbal ingredients, which are generally considered safe and free from harmful side effects.

Among the four formulations, F3 showed superior performance in comparison to F1, F2 and F4. The colour of F3 was observed to be Brown, indicating the presence of herbal constituents, and it exhibited a characteristic as orange odour without any undesirable smell. The formulation showed no foam formation, which is typical for herbal scrubs lacking synthetic surfactants.

The texture and consistency of F3 were found to be smooth and suitable for topical application, with uniformly distributed fine gritty particles providing effective exfoliation without causing irritation. The scrub also demonstrated good spreadability and washability, as it could be easily applied and removed with normal water.

Extrudability test performed with the help of empty collapsible tube filled with scrub, checked for quantity extruded from the nozzle of 5 mm and found satisfactory. The pH of the formulation was 6.64, which is close to the natural skin pH, suggesting that the product is skin friendly and suitable for all skin types. Overall, the evaluation confirms that formulation F3 is stable, effective, and acceptable for cosmetic use, making it a promising herbal alternative to synthetic scrubs.

CONCLUSION

In the present study, a herbal scrub was successfully formulated using natural ingredients such as beal fruit, moringa, turmeric, neem, orange peel and apricot oil. The prepared formulations were evaluated for various parameters, and the results confirmed that they complied with acceptable standards for cosmetic use. The optimized formulation (F3) showed satisfactory properties in terms of appearance, texture, consistency, spreadability, washability, and pH, indicating its suitability for topical application. The presence of natural exfoliants like Beal fruit provided effective removal of dead skin cells, while ingredients such as moringa contributed antioxidant benefits. Turmeric and Neem antiseptic, soothing, and anti-inflammatory effects. Orange peel and apricot oil enhancing overall skin health and give nourishing to the skin. And used carbapol gel base. The formulation was found to be safe, non-irritant, and suitable for all skin types due to its near skin-friendly pH and absence of harmful chemicals. Overall, the developed herbal scrub offers a natural, effective, and economical alternative to synthetic products, promoting smoother, and brighter skin.

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Research Article

Formulation and Evaluation of Anti-Lice Roll on Serum

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Pediculosis capitis (head lice infestation) is a common problem, especially among school going children, causing itching, irritation, and discomfort. The present study focuses on the formulation and evaluation of an anti-lice hair roll-on using natural ingredients such as bhringraj extract, shikakai extract, and Rampal (*Annona reticulata*) seed extract, glycerin, Rose Oil, Clove Oil, and distilled water. These ingredients possess insecticidal, antimicrobial, and soothing properties that help in eliminating lice and preventing their recurrence. The roll-on formulation was designed for easy application, improved patient compliance, and targeted delivery to the scalp. Evaluation parameters included physical appearance, pH, viscosity, spread ability, stability, and anti-lice activity. The formulation showed acceptable pH suitable for scalp application, good stability, and effective lice control due to the synergistic action of components. The study concludes that the developed anti-lice roll-on is a safe, effective, and convenient alternative to synthetic pediculicides, which are often associated with side effects and resistance. This formulation can be further optimized and clinically evaluate for commercial use.

Keywords: Scalp, Children, Head Lice, Ramphal extract, Hair, Roll on.

INTRODUCTION

• Introduction to Hair and Hair Disorders

Hair is a keratinized filament that grows from hair follicles located in the dermis of the skin. It plays an important role in protection, thermoregulation, sensation, and social/psychological identity. Structurally, hair consists of three main parts: the cuticle

(outer layer), cortex (middle layer), and medulla (inner core). The primary protein in hair is keratin, which provides strength and elasticity (1,6).

Hair growth follows a cyclic pattern consisting of three phases

Anagen (growth phase) – active hair growth

Catagen (transition phase) – follicle regression

Telogen (resting phase) – shedding of hair, A normal scalp contains approximately 100,000–150,000 hair follicles, and daily shedding of 50–100 hairs is considered physiological (2,7).

• Hair Disorders

Hair disorders (trichological conditions) refer to abnormalities affecting hair growth, structure, or scalp health. These conditions may result from genetic, hormonal, environmental nutritional, or microbial factors.

Common Hair Disorders

1. Alopecia (Hair Loss)

Alopecia is one of the most common hair disorders and can be classified into:

Androgenetic alopecia (pattern baldness)

Alopecia areata (autoimmune condition)

Telogen effluvium (stress-induced hair shedding) (5,8).

2. Pediculosis Capitis (Head Lice Infestation)

This condition is caused by the parasite *Pediculus humans capitis*. It leads to:

Scalp itching

Irritation

Secondary infections

This is particularly relevant in children and is often treated using anti-lice formulations (herbal or synthetic) (3,9).

3. Dandruff (Pityriasis Capitis)

Dandruff is characterized by flaking of the scalp and is commonly associated with the fungus *Malassezia* species

4. Seborrheic Dermatitis

A more severe form of dandruff involving inflammation, redness, and greasy scales (10).

5. Hair Shaft Disorders

These include structural abnormalities such as:

Trichorrhexis nodosa (hair breakage)

Monilethrix (beaded hair) (4,11).

Currently available products for managing hair lice include medicated, herbal, and mechanical treatments.

Medicated products such as permethrin lotions/shampoos are most commonly used and act by paralyzing and killing lice (3,12) Herbal products like neem and tea tree oil-based shampoos are safer alternatives with anti-parasitic activity (813). In addition, fine lice combs and oil treatments help in the physical removal of lice and nits (14). Combination

therapy (shampoo + combing) is considered most effective (15).

- Common Side Effects

- ✓ Scalp irritation
- ✓ Itching and redness
- ✓ Burning or stinging sensation
- ✓ Dryness of hair and scalp
- ✓ Moderate Side Effects
- ✓ Allergic reactions (rash, swelling)
- ✓ Eye irritation (if accidental contact occurs)
- ✓ Increased hair fall (temporary) (16).

- Serious Side Effects (Rare)

- ✓ Neurotoxicity (especially with misuse or overuse)
- ✓ Breathing difficulty (in sensitive individuals)
- ✓ Toxicity in young children (17).

- Advantages of herbal anti-lice formulations

Safe and less toxic: Herbal ingredients like neem and tea tree oil have minimal side effects compared to chemical insecticides.

Low risk of resistance: Unlike permethrin, herbal products show less chance of lice developing resistance.

Eco-friendly and biodegradable: Natural origin makes them safer for the environment. Multiple actions:

Table 1: Anti Lice serum ingredients

Sr. No	Material	Quantity	Function
1	Neem Oil	0.5ml	Antimicrobial, antifungal, antilice activity
2	Clove Oil	0.5ml	Mild preservative
3	Tween 80	0.5ml	Emulsifying agent
4	Shikakai Extract	4ml	Natural cleanser, conditioning agent
5	Bhringraj Extract	3ml	Ppromotes hair growth, strengthens hair
6	Ramphal seed extract	1ml	Antilice activity
7	Tween 20	0.5ml	Stabiliser, emulsifier
8	Carbopol 940	0.12g	thickener
9	Coconut Oil	1ml	Moistuizer
10	Karanj Oil	1ml	Antilice activity, Antifungal
11	Triethanolamine	0.2ml	Ph adjuster
12	EDTA	02g	Chelating agent
13	Amaranth (colour)	0.02g	Coloring agent
14	Rose Oil	2.64 ml	Fragrance

**Fig 1: Neem Oil****Fig 2: Bhringraj****Fig 3: Shikakai****Fig 4: Ramphal**

RESEARCH METHODOLOGY

• Study Design

The present work was designed as an experimental laboratory-based study for the formulation and evaluation of a anti-lice roll-on serum. The study included formulation development, physicochemical characterization, stability testing, and in vitro pediculicidal activity assessment.

• Materials and Formulation

1. Material
2. Neem Oil
3. Clove Oil
4. Tween 80
5. Shikakai Extract
6. Bhringraj Extract
7. Ramphal seed extract
8. Tween 20
9. Carbopol 940
10. Coconut Oil
11. Karanj Oil
12. Triethanolamine
13. EDTA

14. Amaranth

15. Rose Oil

• Preparation Method

- Aqueous Extraction of Shikakai (*Acacia concinna*)

Method: Maceration (Aqueous Extraction)

1. Dried shikakai pods were cleaned, shade-dried, and powdered using a mechanical grinder.
2. About 40 g powder was taken and soaked in 400 mL distilled water (1:10 ratio).
3. The mixture was kept for 24 hours at room temperature with intermittent stirring.
4. The extract was filtered using muslin cloth followed by Whatman filter paper.
5. The filtrate was concentrated using a water bath at 40–50°C.
6. The final extract was stored in an airtight container at 4°C until further use (19).



Fig 5: Shikakai extract

- Ethanolic Extraction of Bhringraj Leaves (*Eclipta alba*)

Method: Soxhlet Extraction

1. Fresh leaves were washed, shade-dried, and powdered.
2. 50 g powder was placed in Soxhlet apparatus.
3. Extraction was carried out using 500 mL ethanol (95%).
4. The process was continued for 6-7 hours (~15 cycles).
5. Extract was concentrated using rotary evaporator.
6. Semi-solid extract was stored at 4°C (20).

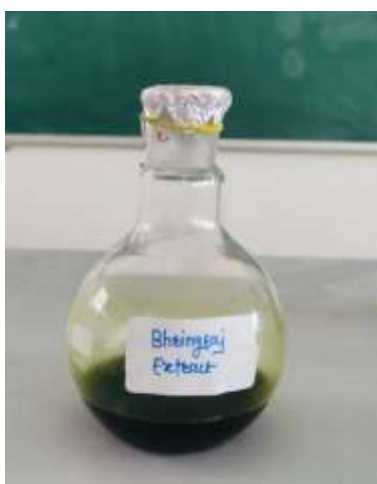


Fig 6: Bhringraj extract

- Ethanolic Extraction of Ramphal Seed Powder (*Annona squamosa*)

Method: Soxhlet Extraction

1. Ramphal seeds were cleaned, dried, and finely powdered.
2. 50 g seed powder was loaded into Soxhlet apparatus.
3. Extraction was performed using 500 mL ethanol.
4. Process continued for 5-6 hours (12-15 cycles).
5. Extract was filtered and concentrated using rotary evaporator.
6. The final extract was stored in amber-coloured container at 4°C (21).



Fig 7: Ramphal extract

1. Preparation of oil phase: Take neem oil, clove oil, coconut oil, and karanja oil in a clean beaker and mix properly.
2. Preparation of aqueous phase: In another beaker, take water and add shikakai extract, bhringraj extract, and ramphal seed extract. Mix well.
3. Emulsification: Slowly add the aqueous phase into the oil phase with continuous stirring.
4. Homogenization: Homogenize the mixture for about 15 minutes to obtain a uniform emulsion.
5. Addition of gelling agent: Add Carbopol 940 slowly with continuous stirring to avoid lump formation.
6. Addition of emulsifiers: Add Tween 80 followed by Tween 20 and mix properly.
7. Neutralization: Add triethanolamine dropwise to neutralize Carbopol and form gel.
8. Addition of stabilizer: Add EDTA and mix well.
9. Final additions: Add amaranth (color) and rose oil (fragrance).

10. Make up volume: Add water if required to make the final volume (≈ 15 ml) and mix thoroughly.

➤ **Evaluation Tests of F3 Formulation (Anti-Lice Serum)**

1. Organoleptic Evaluation

Color: Reddish brown

Odour: Clove-like (pleasant)

Texture: Highly smooth & non-sticky

Clarity: Most turbid

2. pH Determination

Observed pH: 6.5

Inference: Suitable for scalp application (near neutral, non-irritant)



Fig 8: PH Meter

3. Viscosity Determination

Time: 13 sec

Distance: 7.5 cm

Inference: Moderate viscosity → good spread ability and easy application



Fig 9: F3 formulation

4. Homogeneity Test

Observation: No lumps

Inference: Acceptable but not perfectly uniform (needs slight improvement in mixing)

5. Skin Irritation Test

Observation: No irritation

Inference: Safe for topical application

6. Washability Test

Observation: Washes easily with water

Inference: Good washability, no residue

7. Silicate Test

Observation: No colour

Inference: Silicate test fail

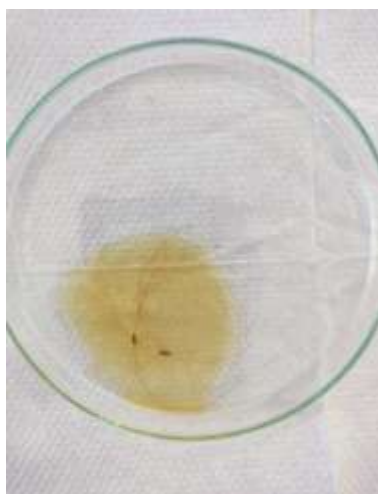


Fig 10: Silicate Test

8. In Vitro test

Observation: death occurs within 1 seconds

Inference: The formulation shows high pediculicidal activity.

**Fig13: Anti Lice Roll on Serum****Fig 11: In vitro Test****Fig 12: Dead Lice**

RESULTS AND DISCUSSION

Results of Descriptive Statics of Study Variables

RESULTS

The formulated anti-lice roll-on serum was evaluated for various physicochemical and biological parameters. The texture was smooth and suitable for roll-on application. The pH of the formulation was found to be 6.5, which is compatible with scalp pH, indicating good skin suitability. The viscosity was moderate, allowing easy application without leakage, and was found to be stable without phase separation. In the homogeneity test, the formulation showed uniform distribution of ingredients with no visible lumps or aggregation. The spread ability was good, ensuring easy application over the scalp. The in vitro

anti-lice activity demonstrated effective action against lice. The formulation showed significant lice mortality within a short duration (1 to 5 seconds), indicating good pediculicidal activity. Neem oil and clove oil contributed majorly to this activity due to their known insecticidal properties. The silicate test performed on the formulation showed a negative result, confirming the absence of silicate impurities and ensuring formulation safety. Stability studies conducted under different conditions showed no significant change in color, odor, pH, or viscosity, indicating that the formulation is stable.

DISCUSSION

The results indicate that the developed herbal anti-lice serum is physically stable, cosmetically acceptable, and biologically effective. The pH being close to scalp

pH suggests that the formulation is non-irritant and safe for topical application. The presence of natural extracts like shikakai and bhringraj enhances hair conditioning and scalp health, while ramphal seed extract, neem oil, and clove oil contribute to strong anti-lice activity. These ingredients work synergistically to paralyze and kill lice while also preventing reinfestation. The use of surfactants such as Tween 20 and Tween 80 helped in forming a stable emulsion, preventing phase separation and improving the overall consistency of the serum. Carbopol 940 provided appropriate viscosity, making the formulation suitable for roll-on application. The *in vitro* results confirm that the formulation is effective against lice, supporting its potential as a natural alternative to synthetic pediculicides, which often cause resistance and side effects. Overall, the formulation meets the desired criteria of efficacy, stability, safety, and user acceptability, making it a promising herbal anti-lice treatment.

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Research Article

Formulation and Evaluation of Herbal Deodorant Using Plant Extract

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Deodorant products are designed to control body odor by inhibiting the growth of bacteria that decompose sweat produced by apocrine glands. However, the use of synthetic antibacterial agents such as triclosan and aluminum salts may lead to adverse health effects, including skin irritation and other long-term risks. Therefore, there is increasing interest in developing herbal formulations using natural ingredients with antimicrobial properties. In the present study, a herbal deodorant formulation was developed using natural components such as chamomile oil, lavender oil, rosemary oil, peppermint oil, beeswax, coconut oil, and castor oil. Essential oils like chamomile, rose, and rosemary are known for their antibacterial activity, while peppermint oil provides a cooling and refreshing effect. Beeswax acts as a structuring agent, coconut oil serves as a moisturizer with mild antimicrobial properties, and corn starch functions as an absorbent to reduce moisture and odor. The prepared formulation was evaluated for various physicochemical parameters including physical appearance, pH, spreadability, consistency, stability, and antimicrobial activity. The results indicated that the formulation possessed a smooth texture, acceptable pH, good spreadability, and stability without any phase separation. Additionally, it demonstrated significant antibacterial activity comparable to conventional deodorant products.

Keywords: herbal deodorant, antibacterial activity, essential oil, physiochemical evaluation, plant based antimicrobial.

INTRODUCTION

Deodorant sticks are widely used to control body odour and are formulated by blending active ingredients with waxes, oils, and other excipients, then moulding them into a solid stick form. Body odour mainly develops in the underarm region due to the high density of sweat glands. Although sweat is initially odourless, it contains lipids that serve as nutrients for skin microflora. These bacteria metabolize the lipids into volatile compounds such as isovaleric acid, which is responsible for unpleasant odour [1]. Odour control can be achieved through proper hygiene, deodorants, or antiperspirants. Deodorants primarily mask odour or inhibit bacterial growth without affecting sweat production, whereas antiperspirants reduce perspiration by blocking sweat glands, thereby limiting bacterial activity [2]. However, conventional deodorants often contain

synthetic chemicals such as parabens, triclosan, and aluminium salts, which may cause skin irritation and have been associated with potential health risks [3,4,5]. In recent years, herbal deodorants have gained significant attention due to their natural origin, safety, and reduced side effects. These formulations utilize plant-based ingredients with antimicrobial, antioxidant, and soothing properties, making them suitable for long-term use [6]. Essential oils such as chamomile, rose, peppermint, and rosemary have demonstrated effective antibacterial activity against odour-causing microorganisms like *Staphylococcus epidermidis* and *Corynebacterium* species [7–9]. Chamomile oil, obtained from *Matricaria chamomilla*, contains active constituents such as α -bisabolol and chamazulene, which exhibit antimicrobial, anti-inflammatory, and skinsoothing properties [10]. Rose oil (*Rosa damascena*) is rich in citronellol and geraniol, providing fragrance along

with calming and mild antimicrobial effects [11,12]. Peppermint oil (*Mentha piperita*) contains menthol, which offers cooling sensation and antibacterial activity by disrupting microbial cell membranes [13]. Rosemary oil (*Rosmarinus officinalis*) is known for its strong antimicrobial and antioxidant properties, making it effective against odourcausing bacteria [14]. In addition to essential oils, natural base materials such as castor oil, coconut oil, beeswax, and cocoa butter play a crucial role in herbal deodorant

formulations. Castor oil exhibits antimicrobial and moisturizing properties, while coconut oil provides skin nourishment. Beeswax and cocoa butter contribute to the structural integrity, stability, and smooth application of the deodorant stick [15,16,18]. Thus, herbal deodorant formulations offer an effective, safe, and eco-friendly alternative to synthetic products by combining antimicrobial activity with skin-friendly properties.

Table 1. Plant profile of ingredients used in herbal deodorant stick

Sr. No.	Ingredient	Scientific Name	Family	Uses	Active Constituents
1.	Beeswax 	<i>Apis mellifera</i> (product)	Apidae	- Emollient - Thickening agent - Stabilizer in cosmetics and pharmaceuticals	Esters (myricyl palmitate), hydrocarbons, free fatty acids
2.	Cocoa Butter 	<i>Theobroma cacao</i>	Malvaceae	- Moisturizer - Skin softener - Improves texture of formulations	Stearic acid, oleic acid, palmitic acid, polyphenols
3.	Coconut Oil 	<i>Cocos nucifera</i>	Arecaceae	- Emollient - Moisturizing agent - Skin softener	Lauric acid, caprylic acid, capric acid, triglycerides
4.	Castor Oil 	<i>Ricinus communis</i>	Euphorbiaceae	- Humectant - Emollient - Enhances product spreadability	Ricinoleic acid, oleic acid, linoleic acid
5.	Chamomile Oil 	<i>Matricaria chamomilla</i>	Asteraceae	- Soothing - Anti-microbial - Anti-irritant	Chamazulene, α -bisabolol, flavonoids
6.	Rose Oil 	<i>Rosa damascena</i>	Rosaceae	- Fragrance - Antidepressant - Skin toner	Citronellol, geraniol, nerol, phenylethyl alcohol
7.	Rosemary Oil 	<i>Rosmarinus officinalis</i>	Lamiaceae	- Antioxidant - Improves circulation - Revitalizing	Cineole, camphor, α -pinene, rosmarinic acid
8.	Peppermint Oil 	<i>Mentha piperita</i>	Lamiaceae	- Cooling agent - Relieves irritation - Deodorising effect	Menthol, menthone, limonene, menthyl acetate

AIM:

Formulation and Evaluation Of Herbal Deodorant Using Plant Extract

OBJECTIVE:

To select suitable medicinal plant extracts possessing antibacterial and antifungal activity. To formulate a

stable, safe, and effective herbal deodorant using selected plant extracts with antimicrobial and fragrance properties. To assess antimicrobial activity against odor-causing microorganisms. To evaluate skin irritation potential and safety.

MATERIALS AND METHODS:

List Of Ingredients:

Table 2. List of ingredients used in formulation study

Sr. No	Ingredients	Role
1	Beeswax	Thickening agent, Emollient
2	Cocoa Butter	Moisturizer
3	Coconut Oil	Nourishing
4	Caster Oil	Anti- inflammatory
5	Chamomile Oil	Antimicrobial
6	Rose Oil	Claming fragrance
7	Rosemary Oil	Antioxidant
8	Peppermint Oil	Cooling, Deodorizing

List of Apparatus and Instruments

Table 3. List of Apparatus Used In Formulation

Sr. No	Apparatus	Uses
1	Porcelain Dish	Holding material mixture
2	Water bath	heat samples gently
3	Tripod stand	To securely support glassware
4	Glass road	stirring mixtures

Table 4. list of instruments used in evaluation test

Sr. No	Instrument	Uses
1	Weighing machine	To determined weight or mass of solid materials used
2	Digital pH Meter	Measures electric potential using two electrodes inserted into liquid to create an electric circuit
3	Heating mentle	Provides uniform heating to glassware, Maintains constant temperature
4	Incubator	Incubation of bacteria and fungi on culture media

Extraction Of Plant Materials**a) Principle**

Hydro-distillation in a Clevenger apparatus relies on co-distillation of the essential oil with steam. Water and plant material are heated together; steam volatilises the essential oil, and the mixture condenses in acooled receiver. The lighter oil separates from the aqueous layer by immiscibility and accumulates in aacalibrated graduated tube, from which the yield can be directly read.

b) Apparatus

The Clevenger apparatus consists of: a round-bottomed distillation flask (1000 mL), a vertical condenser,a calibrated oil receiver (graduated tube), and a side overflow return tube that recycles

condensed waterback to the flask. The apparatus conforms to the design specified in the European Pharmacopoeia [19].

c) Procedure

Step 1 – Sample Preparation: Accurately weigh 30 g of dried chamomile flowers.Coarsely grind with mortar and pestle to increase surface area, facilitating release of essential oil glands.

Step 2 – Loading: Transfer the ground material into the 1000 mL round-bottomed flask. Add 500 mL of distilled water. Connect the flask to the Clevenger apparatus ensuring all groundglass joints are greased and secured. Fill the graduated receiver tube with water via the overflow tube before beginning distillation.

Step 3 – Distillation: Heat the flask using a heating mantle. Apply a gentle temperature gradient reach a slow rolling boil within 15 minutes. Maintain steady distillation at approximately 2–3 drops/second condensate flow. Continue distillation for 3–4 hours (or until no further increase in oil volume is observed in the graduated tube).

Step 4 – Collection: Allow the apparatus to cool to room temperature. Carefully drain the oil from the calibrated receiver into a pre-weighed amber glass vial. For trace amounts of watersoluble terpenoids,

extract the distillation water three times with 10 mL of hexane; combine organic layers and evaporate solvent under reduced pressure at 40°C.

Step 5 – Yield Calculation: Record oil volume (v/v%) and calculate yield: $\text{Yield (\%)} = (\text{Volume of oil collected} / \text{Weight of plant material}) \times 100$. A typical chamomile oil yield is 0.3–0.8% v/w.

Step 6 – Storage: Transfer oil to dark amber vials, flush with nitrogen, and store at 4°C until use[20].



Fig 1. Extraction of Essential Oil by Clevenger Method

d) Quality Assessment of Extracted Oil

The extracted oil was evaluated for refractive index (using Abbe refractometer), specific gravity (using pycnometer), optical rotation (using polarimeter), and colour/odour (organoleptic).

e) Preliminary Phytochemical Screening

Phytochemical screening was performed on aqueous and ethanolic extracts of chamomile flowers and rosemary leaves to identify major classes of phytoconstituents according to standard methods [21,22,23].

f) Preparation of Extracts for Screening

Aqueous Extract: Weigh 5 g of coarsely powdered plant material into a 250 mL beaker. Add 100 mL of distilled water. Boil for 15 minutes with stirring, cool and filter through Whatman No.1 filter paper.

Use filtrate for tests. **Ethanolic Extract:** Weigh 5 g of powdered material into a conical flask. Add 100 mL of 95% ethanol. Macerate for 48 hours with intermittent shaking. Filter and use the filtrate for tests.

Method of Preparation of Herbal Deodorant Stick (HDS)

Bees wax and cocoa butter was taken in a china dish and placed into water bath which was set to 75°C, for 4 - 5 minutes. Careful attention was paid to this process to ensure that the temperature is not too high. Quick melting was ensured & to avoid charring. On confirming the complete melting of bees wax and cocoa butter, it is removed from water bath; virgin coconut oil, castor oil, rose oil, rosemary oil, chamomile oil, peppermint oil, were added and mixed well (table). The solution was poured into the pre lubricated container & allowed to settle for 24 hours [24,25,26].

Table 5. Composition of the different formulation

Sr.no	Ingredient	F 1	F 2	F 3
1	Bees wax	5 gm	6 gm	7 gm
2	Cocoa butter	3 gm	3 gm	3 gm
3	Coconut oil	2 ml	2 ml	2 ml
4	Caster oil	2 drops	2 drops	2 drops
5	chamomile oil	0.5ml	1ml	1.5ml
6	Rosemary oil	1ml	1ml	1ml
7	Rose oil	1ml	1ml	1ml
8	Peppermint oil	1ml	1ml	1ml

Physicochemical Evaluation Parameters

1. Physical Appearance

Examining a deodorant stick's look, colour, texture, scent, and odour is known as physical observation. A visual examination offers important information about the quality, texture, and look of items, guaranteeing a premium deodorant stick that lives up to customer expectations.

2. pH Measurement

The pH of each formulation was determined by dissolving 1g of the deodorant stick in 10 mL of distilled water with gentle warming, cooling to room temperature, and measuring with a calibrated digital pH meter. The normal skin pH ranges from 4.5 to 6.5; deodorant formulations should ideally maintain a pH within this range to avoid skin irritation [27]. Measurements were taken in triplicate and the mean value was recorded. The pH of F1, F2 & F3, was found to be from 6.92 to 7.10 which are suitable for the human skin and non-irritant upon application (Table 7). The pH of the resulting solution was then determined using a digital pH meter.

3. Breaking point

A laboratory test called the breaking point test, sometimes referred to as the "break test" or "flexural test," is used to assess the mechanical strength and flexibility of solid products like deodorant sticks. A test in which the weight on the stick is gradually increased until it breaks. The operation is normally done in a series of weight increases of 10 grams each after every 30 seconds. The breaking point is defined as the highest weight that the stick can hold without

breaking. This test determines the deodorant stick's strength and stability so that it can sustain typical handling and use without breaking. Breaking point for Herbal Deodorant stick as performed. The prepared herbal deodorant stick can hold 50g of weight for more than 30 seconds [28].

4. Spreadability test

The spreadability test for a deodorant stick evaluates how easily the product spreads on the skin and ensures smooth application. Since sticks are solid, the test is performed using modified semisolid methods. In the parallel plate method, a small scraped sample is placed between two glass plates, a known weight is applied, and the diameter of spread is measured to calculate spreadability using. Another method is the slip and drag (glide) test, where the stick is applied on a surface and the time required to move under weight is measured, reflecting real application performance. Good spreadability indicates proper formulation balance, easy glide, and better consumer acceptability [29].

5. Stability testing

Stability testing of a deodorant stick is carried out to ensure that the product maintains its physical, chemical, and microbiological properties throughout its shelf life. In this test, the deodorant stick is stored under different environmental conditions such as room temperature (25°C) and accelerated conditions (40°C ± 2°C and 75% relative humidity) for a specific period. During storage, the formulation is periodically evaluated for changes in color, odor, appearance, homogeneity, pH, melting point, and spreadability. Chemical stability is assessed by checking the degradation or oxidation of ingredients, while

microbiological stability ensures that there is no microbial contamination and that preservatives remain effective. This test helps determine the shelf life, safety, and overall quality of the product and ensures that it remains stable during storage and use. Stability testing is essential to prevent issues like melting, phase separation, unpleasant odor, or reduced effectiveness [30].

6. Antibacterial Activity (Agar-Well Diffusion Method)

The antibacterial activity of all three formulations was evaluated against *Escherichia coli* and *Staphylococcus aureus* epidermidis ATCC 12228 using the agar-well diffusion method on Mueller-Hinton agar. Ciprofloxacin (5 µg/disc) was used as the positive control and melted plain base (beeswax + coconut oil without essential oils) as the negative

control. The diameter of the zone of inhibition (ZOI) was measured in millimeters after 24 hours incubation at 37°C. All tests were performed in triplicate[31].

RESULT AND DISCUSSION

RESULT

Percentage Yield of Extracts

The essential oil was obtained by hydro-distillation using a Clevenger apparatus. Reported practical yield (based on your method):

Chamomile oil yield $\approx$ 0.3–0.8% v/w

Evaluation Results of All Batches

1. Physical Appearance

Table 6. Evaluation of physical observation

Sr. No	Formulation	appearance	colour	odour	texture	Fragrance
1	F1	Dull	Off white	Pleasant	Smooth	Mild
2	F 2	Glossy	Off white	Pleasant	Smooth	Strong
3	F 3	Glossy	Off white	Pleasant	Smooth	Strong

Physical observation of F1, F 2 and F 3 were studied and the results are tabulated in table no 6. The results indicate that the formulated Deodorant stick 2(F2) had compatible physical observation which was

comparable with that of the Deodorant stick 1(F1) and Deodorant stick 3(F3).

2. pH Measurement

Table 7. Evaluation of pH

Sr. No	Formulation	pH
1	F1	6.98
2	F2	6.92
3	F3	7.10



Fig 2. pH of F2

The pH of F1, F2 & F3, was found to be from 6.92 to 7.10 which are suitable for the human skin and non-irritant upon application (Table 7). The pH of the

resulting solution was then determined using a digital pH meter.

3. Breaking point

Table 8. Evaluation Of Breaking Point

Sr. No	Formulation	Breaking point
1	F1	20
2	F2	30
3	F3	50



Fig 3. Braking point of F1

Breaking point was done to determine the strength of deodorant stick. The weight was gradually increased by a specific value (10 gm) at specific interval of 30 second and weight at which breaks was considered as

the breaking point. The result of breaking point is displayed in table 8.

4. Spreadability Test

Table 9. Evaluation of Spreadability Test

Sr. No	Formulation	Observation
1	F1	Intermediate
2	F2	Excellent
3	F3	Excellent



Fig 4. Spreadability of F2

Spreadability of F2 & F3 was tested and found to have excellent Spreadability which are tabulated in table 9.

5. Stability Test

Table 10. Evaluation of Stability Test

Sr. No	Formulation	Colour change	Sweating	Melting
1	F1	NO	NO	NO
2	F2	NO	NO	NO
3	F3	NO	NO	NO

Sweating is an excess of oil or solvent occurred onto the surface of the deodorant sticks. Sweating can be seen clearly if the sample is unstable. Table 10 shows

that all the sticks were stable upon storage for 2 weeks at room temperature.

Antibacterial Activity (Agar-Well Diffusion Method)

Table 11. Evaluation of Anti-Microbial Test

Sr. No	Formulation	Zone of inhibition (mm)	
		Microorganisms	
		S.aureus	E.coli
1	F1	22	23
2	F2	19	16
3	F3	20	18



Fig 5. Antimicrobial Test

Selection of Optimized Formulation

F2 is selected as the optimized formulation because:

- Best balance of properties
- Excellent spreadability
- Acceptable mechanical strength
- Good antimicrobial activity Superior aesthetic properties (glossy, strong fragrance)

Although F3 had higher strength, it may be too hard, affecting application. F1 showed better antimicrobial activity but weaker physical properties.

DISCUSSION

The antimicrobial activity observed aligns with studies showing essential oils like chamomile, rosemary, and peppermint inhibit odor-causing bacteria. Similar studies report zones of inhibition ~15–25 mm, consistent with your results. The pH range (~6.9–7.1) agrees with reported safe deodorant formulations. Stability results match literature indicating beeswax + cocoa butter systems provide good structural stability. Spreadability and texture findings are comparable with previously reported herbal deodorant sticks.

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Research Article

Formulation and Evaluation of Herbal Lip Tint Using Beta vulgaris Extract

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ABSTRACT

One of the cosmetic item that is frequently used is lip tint . Due to rising awareness regarding safety and sustainability, herbal cosmetics prepared using natural ingredients are gaining global importance. These research work is based on formulation and evaluation of herbal lip tint by using natural ingredient Beta vulgaris (Beetroot). Beta vulgaris (commonly known as beetroot) is a natural source of red violet pigments called betalains, particularly betacyanin. These pigments are water soluble and responsible for the characteristic deep red color of beetroot. This formulation applied on the lips to prevent drying, give tint of color to the lips and protect against adverse factors of the environment. The evaluation of lip tint is carried out by various parameters like texture, spreadability, colour, pH, stability, fragrance as well as its effectiveness in terms of hydration. The stability test are conducted to ensure that the quality of product maintain over time under various environmental condition. The further scope of herbal lip tint is highly promising, because of rising the global demand of herbal and natural beauty product. The adverse effect of synthetic lip tint or lip balm is removed by herbal lip tint. Moreover, there is great potential for innovation in this space, from customized tints to eco-friendly packaging and multipurpose applications.

INTRODUCTION

Lips - The lips are soft, movable structures forming the opening of the mouth. Lips and skin have different structural characteristics . The Skin of the lips have small no. of melanin cells. This makes blood vessels under the skin of the lips more visible, providing the lips a beautiful shade of

pink. Lips are covered by thin skin (no sweat glands) . [4]

Problems related to lips – Lips disorder affect the structure, colour or health of lips.

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1. Dry and Chapped lips – Caused by dehydration, cold weather or excessive licking.
2. Pigmentation – Due to sun exposure, smoking, caffeine or hormonal changes.
3. Lip Cracks – Due to extreme dryness or vitamin deficiency.
4. Swelling- Hereditary angioedema is a disorder that can result in repeated episodes of swelling ^[2]
5. Inflammatory response: The corners of the lips may become uncomfortable, scorching, red, cracked, and scaly when the lips become inflamed (cheilitis). A diet low in vitamin B2 may be the cause of cheilitis.
6. Discoloration – Hyperpigmentation, Freckles, Systemic condition.
7. Sun Damage – Lips can get sunburned due to UV exposure. ^[5]



Dry lips



discolored lips

The Various products are available in the market to avoid various types of lips problems, such as –

- Lipsticks
- Lip balm
- Lip gloss
- Lip Cream
- Synthetic Lip tin

All above the products are synthetic in nature that have various side effects or limitations. In the above-mentioned cosmeceuticals various synthetic colours and ingredients are used for good appearance and for cosmetic purpose. The above-mentioned cosmeceuticals give good appearance but not any kind of therapeutic effect. Due to the presence of hazardous synthetic excipients in cosmetics, there has been a great public concern regarding the use of organic sources. Lips do not have any oil glands; thus, it is important to provide extra moisture and protection throughout the day. ^[6] Additionally, these synthetic substances can negatively impact the environment and contribute to pollution. As a result, consumers are becoming more cautious in their selection of cosmetic products^[7]. With increasing awareness of environmental and health concerns, consumers are leaning toward green beauty. ^[8]

Herbal lip tints are an innovative category of cosmetic formulations that aim to deliver both color and care. Unlike conventional lipsticks that may contain parabens, heavy metals, artificial fragrances, and synthetic dyes herbal lip tints utilize natural plant-based colorants, oils, waxes, and antioxidants, offering a healthier alternative.

^[1] One of the plants that has the potential to be developed as a lip balm is the beetroot tuber plant.

^[10] In the formulation of herbal lip tint beetroot

(*Beta vulgaris*) is use as natural colourant. Beetroot is often also known as the root of a plant with a root shape similar to a bulb. The dye (pigment) found in red beets is betalain, which is the most abundant content in Beetroot. The content of betacyanin (purple pigment) and betaxanthin (yellow pigment) is a natural dye that forms a purplish dark red color. In addition, there is a content of Betalain, which is a group of antioxidants, vitamins and minerals such as vitamins B, calcium, phosphorus, nutrients and iron. [9] Beetroot lip tint fits perfectly due to its: Biodegradable and renewable ingredients. Vitamin C in beetroots helps with collagen production, which is crucial for maintaining with plumpness and firmness. Iron and folate helps to nourish the skin and support circulation, which can enhance lip health and natural colour. [8]

Beetroot consists of the fleshy taproot of *Beta vulgaris*, belonging to the family Chenopodiaceae (now often classified under Amaranthaceae). Beetroot contains several important phytochemicals like Betalains as major pigments i.e. Betacyanin (red pigment) and Betaxanthin (yellow pigment), Vitamin C, Vitamin B9, Minerals, Carbohydrates and other constituents like polyphenol, flavonoids and nitrates. Beetroot is use as natural colourant in lip tint and cosmetics. It act as an anti- oxidant, it is use for skin glow and hydration .



Lip tint

Review of Literature :

1. Kumodini Bansod et al. (2025):

Developed and evaluated a herbal lip tint using natural ingredients such as glycerin, vitamin E, beeswax, strawberry and beetroot powders, along with oils like castor, tea tree, and coconut oil. The formulation was designed to provide moisturizing, protective, and coloring effects, making it a multifunctional cosmeceutical product. The study assessed various physicochemical parameters including texture, spreadability, and melting point, along with performance aspects like hydration, healing of dry lips, and user acceptability. Stability testing confirmed that the formulation maintained its quality under different environmental conditions.

The authors highlighted that herbal lip tints have strong future potential due to increasing consumer preference for natural, safe, and sustainable cosmetic products. Growing awareness about harmful effects of synthetic ingredients and the trend toward minimalistic beauty further support the demand for plant-based formulations. Additionally, opportunities exist for innovation in areas such as personalized products, eco-friendly packaging, and multifunctional applications

2. Nitika Kumari ,Padma youdol(2024):

One cosmetics item that is frequently used is lip balm. A waxy material called lip balm is applied to the lips to maintain moisture. The purpose of the lip balm is to shield the lips from outside factors, like the winter cold, and to avoid chapped and dry lips. Lip balm shields lips from irritation and illness. It also lessens the discomfort that comes with chapped lips. The lip balm's components aid to treat cracked lips and moisturize the lips. Lip balm isn't gender-specific like lipstick. The majority of them are waxy in texture. Lip balm is a type of moisturizer that is used to protect the lips

from environmental factors and prevent them from drying out. The adverse effects of lip balm are lessened when herbal substances are used.

3. Nakshtra Wagdhare and Pawan Mali (2025)

It described cosmetic science as a multidisciplinary field that integrates chemistry, biology, dermatology, and consumer behavior to enhance human aesthetics. The field has evolved significantly from traditional beauty practices to a modern, technology-driven discipline. The authors highlighted that major advancements in the 20th century led to the development of sophisticated formulations containing emulsifiers, preservatives, and synthetic colorants. In recent years, cosmetic science has expanded its focus beyond appearance to include skin health, safety, and ethical considerations. Ingredients such as hyaluronic acid and retinoids are extensively studied for their therapeutic and cosmetic benefits. Furthermore, the study emphasized the growing importance of regulatory standards, sustainability, and consumer awareness in shaping the cosmetic industry. Emerging technologies like nanotechnology and artificial intelligence are playing a crucial role in advancing formulation strategies and product innovation, reflecting the continuous evolution of cosmetic science.

4. Pawar et al. (2025):

Many lip-care products used daily, like lipsticks and lip balms, contain harmful chemicals such as heavy metals and preservatives. These substances are not just bad for your skin they can also enter your body through the pores on your lips or when you accidentally swallow small amounts while eating or drinking. While these products are mainly used to make the lips look more attractive, they should also help in keeping the lips healthy

and protected. Unfortunately, most of the commercial lip products on the market rely on artificial chemicals, colors, and synthetic flavors. Over time, these chemicals can cause skin irritation, dryness, darkening of the lips, or even allergic reactions. That's why natural and organic lip balms are becoming more popular. These are made using safe, plant-based ingredients that not only enhance the appearance of your lips but also keep them soft, smooth, and hydrated.

5. Payal Solanke et al.(2025):

The primary focus of this study is the creation and assessment of a natural lip balm that uses beetroot juice as its primary ingredient. Beetroot, renowned for its vibrant colour and potential health advantages, is a promising ingredient in cosmetics because of its natural pigments and moisturising properties. The first step in the research process is creating a lip product formulation that includes beetroot juice and other natural components. The formulation of the lip balm is then assessed in terms of its physical, chemical, and sensory properties. By examining a number of factors, such as colour, pH, texture, scent, and moisturising effectiveness, the product's overall quality and consumer appeal are evaluated. Additionally, stability tests are performed to guarantee the lip balm's longevity and shelf life under various storage circumstances. In addition to offering insights into the possible advantages of using beetroot juice in lip care products, the study's findings hope to support the rising demand for sustainable and natural cosmetics. In the end, the study aims to provide a competitive substitute for traditional lip balms, encouraging environmentally responsible and health-conscious cosmetics.

Aim :- Formulation and Evaluation of Herbal Lip Tint Using *Beta vulgaris* Extract .



Objective :- To formulate a stable lip tint using natural ingredients . To formulate a natural lip tint having suitable fragrance not affecting its natural properties. To replace the synthetic dyes with the natural, safe and non – toxic alternative. Also to evaluate the prepared lip tint for pH, spreadibility, and stability.

MATERIAL AND METHODS

The ingredient used in herbal lip tint are as follows-

Sr. no.	Ingredient	Instrument	Apparatus
1	Beetroot (<i>Beta vulgaris</i>)	Weighing balance	Beaker
2	Coconut Oil	pH meter	Stirrer
3	Castor Oil		Water bath
4	Beeswax		Tripod stand
5	Almond Oil		Burner
6	Vanilline		Measuring cylinder
7	Methyl Paraben		Conical Flask
8	Vitamin E		
9	Ethanol		
10	Distilled Water		

Beetroot –

Beetroot powder is a multifunctional, natural ingredient in herbal lip tint. Beetroot is a dark red vegetable, rich in vitamins, antioxidants, and natural color. It is often used in natural skincare for its beauty benefits. It provide a beautiful tint and its inclusion enhances both the aesthetic and therapeutic value of the product. [8, 11]

Nomenclature:

- **Common Name:** Beetroot, Garden Beet, sugar Beet, Red Beet
- **Botanical Name:** Beta vulgaris subsp. Vulgaris

- **Family:** Chenopodiaceae
- **Origin:** Europe and Africa
- **Plant Type:** Biennial (grown as an annual for roots)
- **Chemical constituents** : Amino acid, minerals [8]



Beta vulgaris extract

Coconut Oil (*Cocos nucifera*) -

Coconut oil (*Cocos nucifera*), derived from the meat of mature coconuts, has emerged as a versatile and highly valued natural product with a wide array of applications. Renowned for its distinct aroma, creamy texture, and myriad health benefits, coconut oil has been utilized for centuries across various cultures for culinary, medicinal, and cosmetic purposes.[6]

Function:

- Used as a moisturizer and emollient in the formulation
- Prevents lip dryness
- Provides a smooth and hydrating texture.

Mechanism of Action:

With its unique composition rich in medium-chain fatty acids and antioxidants, coconut oil has garnered attention not only in traditional medicine



but also in modern scientific research.^[6] The fatty acids in coconut oil penetrate the skin and help maintain hydration, preventing the lips from becoming dry or cracked.^[1]



Cocos nucifera

Castor Oil (*Ricinus Communis*) –

Castor oil (*Ricinus Communis*) is a vegetable oil obtained from the seeds of the castor bean plant. It is rich in ricinoleic acid, which gives it its emollient properties.^[1] It is especially valued in herbal and natural cosmetic products for being plant-based, skin-friendly, and effective at dispersing pigments.

Whether used alone or with other oils, castor oil plays a vital role in enhancing both the function and aesthetic of lip tint products.

Use:

1. Provides Shine
2. Acts as a Natural Emollient
3. Carrier Oil for Pigments and Actives
4. Enhances Texture
5. Natural and Skin-Friendly ^[11]



Ricinus communis

Beeswax -

Bees create beeswax to build the honeycomb in their hives. Beeswax is made up of special ingredients like fats and oils, which give it strength and helpful qualities. ^[8] It is incredibly moisturising, has a lovely scent, and may shield the lips against UV rays that harm them act as a natural emulsifier. The anti-bacterial property in beeswax helps to lessen the discomfort of the inflammation that follows an infection. ^[12] It gives solid cosmetics structure by thickening them up and maintaining their solid state for seamless application. ^[2]

Nomenclature :

Botanical Name: *Ceropegia ampliata*

Common Names: Beeswax plant, Bushman's pipe, Horny wonder

Plant Family: Apocynaceae

Origin: South Africa, Namibia

Plant Type: Perennial succulent vine



Beeswax

Almond Oil -

Almond oil is a natural oil obtained from the seeds of the almond tree, scientifically known as *Prunus dulcis*. Almond oil goes deep into the skin and helps keep the lips soft and smooth because of its healthy fats. It also helps reduce pain and dryness caused by chapped or sunburned lips. It also has antioxidants that protect the lips from wrinkles and damage. As an emollient, it smooths and softens the skin by filling gaps between skin cells. Almond oil contains oleic acid and linoleic acid, essential fatty acids that restore the skin's natural lipid layer, keeping lips healthy and protected from environmental damage. It protects lip skin cells from oxidative stress and premature aging. [8]



Almond oil

Vanilline (*Vanilla planifolia*) –

Vanilla essence is derived from the beans of the vanilla orchid, which contains vanillin, a compound with antioxidant properties.

- **Function:** Adds fragrance and enhances the sensory appeal of the lip tint.
- **Properties:** Provides a pleasant, sweet fragrance while offering mild antioxidant effects.
- **Mechanism of Action:** Vanillin protects the product from oxidative damage and masks any herbal odors, making the lip tint more appealing to consumers [1]



Vanilla planifolia

Vitamin E –

Vitamin E nourish and protects the lips while enhancing the effect of the beetroot's natural tint. It is available as tocopherol or tocopheryl acetate in beauty formulations, known for its skin protective qualities[8]. Vitamin E can help to close up the painful cracks in the skin that are caused by dryness and cold weather and can seal up cracks and keep the skin of your lips soft, supple [13]. It slows down the ageing process, keeping the lips' delicate, young texture.

Utilising vitamin E on dry lips speeds up the appearance of newly formed cells because it encourages cell repair and cycle. [12]



Vitamin E

Formulation – The formulation of the herbal lip tint was designed to combine natural colorants, emollients, and therapeutic agents to provide a tinted, moisturizing, and protective effect on the lips. The ingredients were selected based on their safety, functionality, and compatibility ^[1]

Sr. No.	Ingredients	Quantities		
		F1	F2	F3
1	Beetroot Extract	1ml	1ml	1.2ml
2	Coconut Oil	2.2ml	2.2ml	-
3	Castor Oil	4.6ml	3.12ml	3.64ml
4	Almond Oil	-	-	2.08ml
5	Vanilline	q.s.	q.s	q.s
6	Beeswax	2g	1.5g	0.3g
7	Vitamin E	0.11ml	0.22ml	0.22ml
8	Methyl Paraben	0.2g	0.1g	0.2g
9	Glycerin	-	0.16ml	0.8ml

Method of Preparation –

Preparation of Beetroot Extract (Coloring Agent) :

1. **Cleaning:** Wash fresh beetroot thoroughly to remove dirt and impurities.
2. **Peeling and Cutting :** Peel the beetroot and cut it into small pieces.
3. **Grinding:** Grind the pieces into a fine paste without adding water.

4. **Weighing :** Weigh the required quantity of beetroot paste.
5. **Addition of Ethanol :** Add Ethanol and Water in the ratio of 70:30
6. **Maceration :** Transfer into a closed container, Keep for 24–48 hours and Shake occasionally (every few hours)
 - This helps dissolve betalain pigments
7. **Filtration:** Filter using muslin cloth or filter paper, Collect the reddish extract
8. **Concentration (Optional but Recommended) :** Evaporate excess ethanol, Keep on water bath (below 50°C) OR allow to evaporate at room temperature to obtain thick concentrated pigment (Betalain extract)
 - You will get a more concentrated extract
9. **Storage :** Store in amber-colored bottle, Keep in cool place (preferably refrigerator)



grinding of beetroot



weighing



Maceration



Filtration



Storage of extract

Preparation of Natural Lip Tint:

Step 1: Melting the Base: Take beeswax in a beaker. Melt it using a hot water bath

- Temperature: 65–70°C.

- Stir until it becomes completely liquid.

Step 2: Adding Oils: Add coconut oil, almond oil, castor oil to the melted wax. Add Vitamin E oil as a natural antioxidant. Continue stirring to mix thoroughly.

Step 3: Incorporating Beetroot Extract: Add the prepared beetroot pigment slowly into the warm wax–oil mixture. Stir continuously to ensure uniform dispersion of color. Maintain low heat to avoid pigment degradation (betalains are heat-sensitive).



Step 4: Add flavouring agents such as: Vanilline / Lavender oil / Olive Oil / Rosemary Oil .

Step 5: Homogenization/ Mix the entire formulation until:

- The texture becomes smooth.
- The color is uniform.
- No lumps are present.

Step 6: Molding/ Pour the warm mixture into: Lip tint containers.

Step 7: Cooling: Allow it to cool at room temperature. The mixture solidifies into a semi-solid, smooth lip tint.



F1



F2



F3

Storage:

- Store lip tint at room temperature.
- Avoid high heat and direct sunlight (betalain pigment may fade).
- This method yields a smooth, spreadable, semi-solid lip tint ^[5]

EVALUATION PARAMETER –

➤ Physical Appearance –

1. Colour : Usually a deep reddish-pink or maroon shade due to the natural pigment (betalain) found in beetroot. The tint can vary based on how much beetroot extract or powder is used.
2. Texture : Smooth and creamy, sometimes slightly waxy depending on the base ^[8]

➤ pH Measurement -

The pH measurement is performed to ensure the product is safe and non-irritating for lips. For this 1g of lip tint is diluted with 10 ml distilled water, the pH was then measured using pH meter. ^[11] The result show that the lip tint had pH close to neutral.



Fig. Ph of F1



fig.Ph of F2



Fig. Ph of F3

➤ Stability Study-

Prepared lip tint was placed for accelerated stability studies at room temperature (25 °c), at accelerated temperature (40°C) and at refrigerated temperature (4°C) for 30 days .After 30 days it was again characterized for organoleptic properties, melting point, spreadability and pH [8]

➤ Skin Irritation Test –

To accomplish this, apply the product as a patch to the skin, wait 30 minutes, and look for any signs of:

- No reaction
- Irritation
- Redness [2]

➤ Melting point –

Take a capillary tube,

• fill it with the test sample at one end, and then seal the other end

• The capillary tube should be placed in a melting point device

• Turn the knob on the heater. Check the test sample's melting point. [3]

➤ Spreadability-

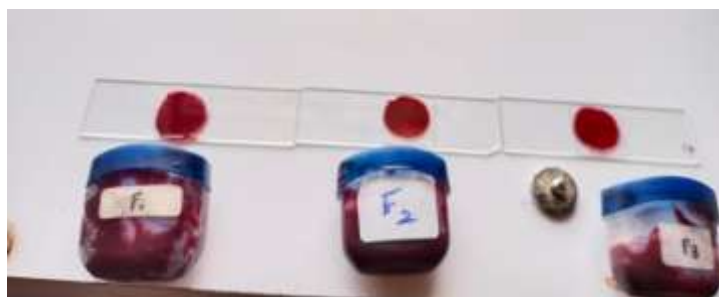
Spreadability is assessed with the aid of a slide. The lip tint is placed on a slide and then another slide is placed on it, load is applied. Regarding the homogeneity of the layer creation, visual observations were made

The following standards have been determined for this examination:

G: Good: uniform

I - Leaves few stops; moderate uniformity

B - bad: uneven



spreadability of F1, F2, F3



Spredability of F1, F2, F3

➤ Washability-

The ease of removal of the lip tint was tested by applying it to the skin and attempting to remove it with plain water. A good lip tint should be semi-permanent but removable with mild cleansing.

➤ Microbial limit test-

The test is important to ensure the product is safe and free from harmful microorganism. Microbial

limit test is used to estimate the number of viable microorganism and also detect the presence of specific pathogens.

Purpose:

- Prevent infection (especially on cracked lips).
- Ensure product safety during storage.
- Check effectiveness of preservative.



Microbial limit test

Sr. No.	Evaluation Parameter	Obervation		
		F1	F2	F3
1	Physical Appearance			
	• Texture	Smooth, slightly waxy	smooth	Smooth
	• Colour	Reddish pink	Reddish pink	Reddish pink
2	pH Measurement	5.95	6.12	6.21
3	Stability Study	stable	Stable	Stable
4	Skin Irritation	No reaction	No reaction	No reaction
5	Melting Point	60-65 °c	50-60 °c	45-55 °c
6	Spreadability	Good (1.8 dia.)	Good (1.9 dia.)	Good (1.8 dia.)
7	Washability	Easily washable	Easily washable	Easily washable
8	Microbial limit test	Pass	Pass	Pass

RESULT :

The goal of the formulation of this lip tint was to utilize a natural coloring agent in place of synthetic dyes, which may be associated with possible

adverse effects. The study focused on the formulation and evaluation of a herbal lip tint using extract of Beta vulgaris as a natural color source. The results shows that this extract is a safe



and effective alternative, providing a rich pink tint while ensuring lip safety and care.

The developed lip tint shows desirable cosmetic characteristics, including a smooth texture, pleasant aroma, good spreadability, and an attractive color. The use of *Beta vulgaris* extract successfully eliminated the need for artificial coloring agents while still achieving an appealing tint.

Further evaluation parameters included stability testing, pH determination, microbial contamination analysis, skin irritation test, and spreadability testing. The formulation remained stable under both room temperature and refrigerated conditions. The pH of the lip tint was found to be 6.12, which is suitable for cosmetic applications. Additionally, the product showed excellent spreadability, uniform application, and no noticeable changes in consistency over time.

Microbial and skin irritation studies confirmed that the formulation is safe for use, indicating that the herbal lip tint is both effective and beneficial for lip care.

SUMMARY AND CONCLUSION :

Making lip tint from beetroot is a great step forward in natural skincare. This project was carried out to develop a herbal lip tint prepared using naturally derived ingredients, with beetroot (*Beta vulgaris*) extract serving as the primary coloring component. Various excipients such as waxes, oils, and antioxidants were incorporated to enhance the product's functional and aesthetic properties. The prepared formulation was subjected to multiple evaluation tests including physical appearance, pH, spreadability, stability, melting behavior, and skin compatibility. The findings confirmed that the formulation was stable, safe for use, and suitable as a cosmetic

product. The prepared lip tint provide dual action such as Cosmetic and therapeutic.

Appropriate natural ingredients were carefully selected to ensure safety and effectiveness. Beetroot extract containing natural pigments was prepared using a suitable extraction method. The formulation was developed by blending waxes, oils, and the extract under controlled conditions. Different combinations were tested to achieve the desired consistency, color, and texture. The final product was evaluated using standard parameters such as pH, spreadability, and stability. Based on the evaluation results, the formulation was found to meet the intended objectives. The developed herbal lip tint offers a safer alternative to conventional products that often contain synthetic chemicals. It not only enhances the appearance of the lips but also provides nourishment and protection. Due to its natural composition, the formulation is environmentally friendly and suitable for regular use.

There is considerable scope for further improvement and innovation in herbal lip tint formulations. Future work may focus on enhancing product stability, developing new shades using different plant-based pigments, and improving overall performance. Additionally, the use of sustainable packaging and customization based on consumer needs can be explored. With increasing awareness and demand for natural cosmetics, such formulations are expected to gain wider acceptance in the market.

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CONFLICT OF INTEREST:

The authors declare no conflict of interest.

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Research Article

Formulation and Evaluation of Multipurpose Herbal Based Foot Cream

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ABSTRACT

The present study focuses on the formulation and evaluation of a multipurpose herbal-based foot cream using natural ingredients such as neem, bael, and aloe vera. The aim was to develop a safe, effective, and economical formulation with moisturizing, antimicrobial, and healing properties. The cream was prepared and evaluated for various physicochemical parameters including colour, odour, texture, homogeneity, spreadability, washability, pH, and antimicrobial activity. Two formulations (F1 and F2) were developed and compared. The results indicated that the prepared formulations were stable, smooth in texture, and showed good spreadability with no signs of irritation. The presence of herbal ingredients contributed to improved skin health and antimicrobial effectiveness. Thus, the developed herbal foot cream can be considered a promising alternative to synthetic formulations for foot care.

INTRODUCTION

The skin is the largest organ of the human body, covering an approximate surface area of 20 square feet. It is composed of three primary layers, of which the epidermis is the outermost layer that acts as a protective, waterproof barrier and is responsible for determining skin colour. The skin also serves as the body's primary defense against environmental factors and external agents. The feet, being a vital part of the body, are constantly subjected to friction, pressure, and exposure to various external conditions, making them particularly vulnerable to damage and infection.

The skin on the feet is categorized as thick skin and is composed of five distinct layers: stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, and stratum corneum. Due to the absence of sebaceous (oil) glands, the skin in this region tends to become dry, which may lead to discomfort and, in some cases, pain.

The feet are an essential part of the human body and are constantly subjected to friction and environmental exposure. Since the soles lack oil glands, they are more prone to dryness. Poor foot care can result in various problems, often caused by unsuitable footwear. Additionally, cuts and

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cracks in the skin can allow dirt, fungi, and bacteria to enter, leading to infections.

Foot creams made with polyherbal extracts are increasingly favored compared to allopathic products that rely on synthetic chemicals, as herbal formulations are believed to support a more holistic approach to treating foot conditions.

The polyherbal plant extract is known to have antibacterial, healing smoothing activity improves skin texture. In these studies, attempts have been made to develop foot care cream from the polyherbal extract.

The foot is susceptible to microbial infections caused by various bacteria and fungi, including *Staphylococcus aureus* (Staph), *Streptococcus* species, Other Gram-negative bacteria.

Common Local Side Effects of synthetic foot cream are Burning and Stinging: A common, typically temporary sensation upon applying the cream. Skin Irritation: Redness (erythema), itching (pruritus), and discomfort. Dryness and Peeling: The skin may become dry, flaky, or peel (desquamation). Irritation from ingredients: Some creams, such as those containing urea, can cause burning or irritation.

Unlike synthetic alternatives that may contain harsh chemicals, urea that cause irritation, herbal creams are usually gentler, eco-friendly, and better suited for sensitive skin. Some advantages of herbal foot cream are Improved Skin Health & Nutrition, Natural Healing and Repair, Safety and Lower Toxicity, Long-Term Benefits, Aromatherapy and Odour Control.

The aim of this study is to formulate and evaluate a multipurpose herbal-based foot cream using natural ingredients like neem and bael for providing moisturization, antimicrobial, and

soothing effects. The objectives include preparing a stable and homogeneous formulation and evaluating its physicochemical properties such as pH, spreadability, consistency, stability, and antimicrobial activity to ensure its effectiveness and safety.

AIM AND OBJECTIVES :

Aim :

Formulation and Evaluation of Multipurpose Herbal Based Foot Cream.

Objectives :

- To prepare a herbal-based multipurpose foot cream
- To use natural ingredients for moisturizing and healing
- To evaluate physical properties (pH, spreadability, washability, irritancy)
- To check stability of the formulation
- To study antimicrobial activity
- To assess skin irritation and safety
- To develop a safe and cost-effective product

PLAN OF WORK:

- Literature survey
- Selection and Collection of ingredients
- Formulation of the product
- Evaluation parameters

1) Colour

2) Odour



- 3) Texture ➤ Results and discussions
- 4) Appearance ➤ Conclusions
- 5) Spreadability test ➤ References
- 6) Washability test
- 7) Homogeneity test
- 8) Grittiness

MATERIALS AND METHODS :

Excipients used in preparation are as follows :

Table No. 1 : List of Ingredients.

Sr. No	Ingredients	Role	Sources
1	Stearic Acid	Emulsifier and Emollient	Pallav chemicals and solvent pvt,Ltd
2	Cetyl Alcohol	Thickener	Pallav chemicals and solvent pvt,Ltd
3	Beal Leaf	Antimicrobial Activity	From local market
4	Neem Leaf	Antifungal Activity	From local market
5	Aloe Vera	Healing Property	Collected from plant
6	Liquid Paraffin	Emollient	Central drug house (p) Ltd
7	Glycerin	Humectant	Pallav chemicals and solvent pvt,Ltd
8	Triethanolamine	Stabilizer, Emulsifier	Pallav chemicals and solvent pvt,Ltd
9	Methyl Paraben	Preservative	Pallav chemicals and solvent pvt,Ltd
10	Propyl Paraben	Preservative	Central drug house (p) Ltd
11	Lemon Oil	Fragrance	Pallav chemicals and solvent pvt,Ltd
12	Distilled Water	Provide Stability	College lab

HERBS PROFILE :**1. Beal leaf powder**

Synonym: Aegle marmelos linn.

Biological source: Aegle marmelos (beal tree), It consists of the unripe or half-ripe fruits or their slices or irregular pieces of Aegle marmelos Corr.

Family: Rutaceae

Chemical constituents:

The chief constituent of the drug is marmelosin A, B and C (0.5%), which is a furocoumarin.

Other coumarins are marmesin, psoralin and umbelliferone.

The drug also contains carbohydrates (11-17%), protein, volatile oil and tannins. The pulp also contains good amount of vitamins C and A.

Uses:

Used for treating various ailments, including digestive problems, diarrhea, diabetes, skin conditions, and respiratory problems.

Used to relieve pain, inflammation, and symptoms of conditions like arthritis and asthma

Bael leaf extracts are sometimes used as dietary supplements, although there's no strong scientific evidence to support these uses.





Fig 1. Beal Leaf Powder

2. Neem leaf Powder :

Synonyms: Azadirachta indica

Biological Source: Neem is derived from the leaves, seeds, bark, and oil of the tree Azadirachta indica.

Family: Meliaceae

Chemical Constituents: Limonoids: Azadirachtin (major bioactive compound), nimbin, nimbidin, salannin, meliantriol. Flavonoids: Quercetin, kaempferol.

Triterpenoids: Gedunin, nimbolide. Fatty Acids (from seed oil):- Oleic, stearic, palmitic.

linoleic acids, Others: Polysaccharides, tannins, and essential oils.

Uses:

Medicinal: Antibacterial, antifungal, antiviral, Antimalarial, antiparasitic, antidiabetic

Agricultural: Natural pesticide and insect repellent (due to azadirachtin)

Cosmetic: In soaps, shampoos, and creams for its antimicrobial and anti-inflammatory effects.



Fig.2 Neem Leaf Powder

3. Aloe Vera Gel

Synonym: Kummari, Mussabar

Biological source: It is obtained from dried Juice collected by incision from the bases of the leaves of various species of Aloe.

Family: Liliaceae.

Chemical constituents: Vitamins: A, B1, B2, B4, B6, B12, and tocopherol.

Enzymes: Allantoin, catalase, amylase, cellulase, lipase, and others.

Minerals: Calcium, phosphorus, zinc, copper, selenium, magnesium, and chromium.

Amino Acids: Approximately 18 amino acids, including those essential for the body.

Phenolic Compounds: Anthraquinones (aloin, emodin), and other phenolic compounds.

Uses:

Skin conditions: Sunburn relief, wound healing, reducing skin irritation.

Cosmetics: Moisturizing, soothing, and used in various skincare products.

medicinal properties: Anti-inflammatory, antioxidant properties.



Fig.3 Aloe Vera Gel



Fig.4 Evaporation of Extract

LIST OF INSTRUMENTS :

Table No. 2 : List of instruments used in the formulation study

Sr. No.	Name of Instruments	Uses
1	Porcelain Dish	Holding material mixture
2	Weighing machine	To determined weight or mass of solid materials used
3	Pipette	To measuring volume of liquid

Table No. 3 : List of instruments used in evaluation study.

Sr. No.	Name of Instruments	Uses
1	Digital PH meter	Measures electric potential using two electrodes inserted into liquid to create an electric circuit

METHOD OF PREPARATION:

Step 1:

- Extraction**

The method use in extraction is maceration. About 10 gram of neem powder and beal powder was taken in separate conical flask and performing maceration process along with ethanol : water (70 : 30) as a solvent for about 2 days. Filter it to collect the filtrate. After collecting filtrate evaporation was done to get the extract.

Step 2:

- Preparation of oil phase**

Oil phase ingredients such as stearic acid, cetyl alcohol, liquid paraffin were weighed and heated.

Step 3:

- Preparation of water phase**

Water phase ingredients such as glycerine, triethanolamine, water, methyl paraben, propyl paraben, were weighed and heated with continuous stirring.

Step 4 :

The content of water phase were mixed in the oil phase with the homogenizer and then the neem extract, beal extract and aloevera gel added to the mixture. Then drop of lemon oil was added into formulation and the prepared cream were filled and stored in final container and was closed tightly.

FORMULATION TABLE .

Table NO. 4 : Quantity wise batches formulated.

Sr. No.	Ingredients	F1	F2
1	Stearic Acid	2g	2g
2	Cetyl Alcohol	0.5g	0.5g
3	Liquid Paraffin	3g	3g
4	Beal Leaf Extract	1ml	2ml
5	Neem Leaf Extract	1ml	2ml

6	Aloe Vera Gel	1.5g	2g
7	Glycerine	1ml	1ml
8	Triethanolamine	0.2ml	0.2ml
9	Methyl Paraben	0.04g	0.04g
10	Propyl Paraben	0.01g	0.01g
11	Lemon Oil	q.s	q.s
12	Distilled Water	q.s	q.s
13	Total	20g	20g

EVALUATION OF HERBAL FOOT CREAM

- 1. Colour:** A visual inspection was used to determine cream colour.
- 2. Odour:** The Odor of formulated cream was checked by smelling it.



Fig.5 PH Test of F1

- 3. Texture:** The foot cream was smooth and having uniformity in texture.
- 4. Homogeneity:** Developed cream was tested for homogeneity by visual inspection. They were checked for their appearance and presence of any particles.
- 5. Washability:** The formulations were applied on skin; the easy and extent of washing with water were checked manually.
- 6. pH evaluation:** Take 1gm of sample & dissolve in 10ml of ethanol. By heating on water bath for 10 minuets, then filter the content & measure PH using PH meter.



Fig.6 PH Test of F2

- 7. Antimicrobial evaluation:** The antimicrobial activity of the formulated foot cream (F1 and F2) was evaluated using the nutrient agar plate

method. After incubation at 37°C for 24 hours, both formulations (F1 and F2) showed no visible microbial growth on the agar plates.

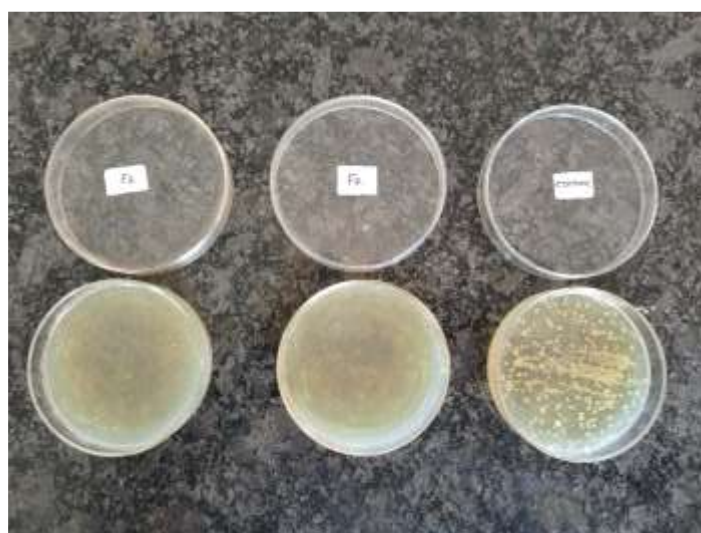


Fig.7 Antimicrobial evaluation

8. This indicates that both formulations possess significant antimicrobial activity against the tested microorganisms.

9. **Spreadability:** The formulation was evenly or uniformly spread. It didn't feel dry and rough to the skin or feet of skin after applying.



Fig.8 Spreadability Test

OBSERVATION TABLE:

Sr. No.	Evaluation Parameter	F1	F2
1	Colour	Faint Green	Faint Green
2	Odour	Characteristic	Characteristic
3	Texture	Smooth	Smooth
4	Homogeneity	Homogeneous	Homogeneous
5	Washability	Washable	Washable
6	PH	5.09	5.66
7	Antimicrobial study	No growth seen	No growth seen
8	Spreadability	Good	Fair

RESULT AND DISCUSSION:

The formulated herbal foot creams (F1 and F2) exhibited satisfactory physicochemical properties, including faint green colour, characteristic odour, smooth texture, and good homogeneity, indicating proper formulation and uniform mixing. Both formulations were easily washable and showed good consistency, making them suitable for topical application.

Spreadability results showed that F1 had better spreadability than F2, which may be due to differences in the concentration of herbal extracts

affecting viscosity and texture. The presence of neem, bael, and aloe vera contributes to antimicrobial, moisturizing, and healing properties, enhancing the effectiveness of the formulation.

Overall, both formulations were stable and acceptable, but F1 showed comparatively better performance in terms of application and consistency.

CONCLUSION:

The study concludes that the herbal foot cream was successfully formulated using natural ingredients

and showed good stability, smooth texture, and suitability for topical use. Among the formulations, F1 performed better and can be considered an effective, safe, and economical alternative to synthetic foot creams.

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Research Paper

Formulation and Evaluation of Herbal Hair Mask

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ABSTRACT

The present study focuses on the formulation and evaluation of a herbal hair mask using natural ingredients as a safer alternative to synthetic hair care products. The formulation incorporates plant-based components such as flaxseed, fenugreek, aloe vera, and hibiscus, which are known for their nourishing, conditioning, and hair growth-promoting properties. The hair mask was prepared using Carbopol 940 as a gelling agent, glycerin as a humectant, sodium benzoate as a preservative, and triethanolamine for pH adjustment. Two formulations (F1 and F2) were developed and evaluated for various parameters including organoleptic properties, pH, spreadability, stability, and skin irritation. The prepared formulations exhibited a pleasant odor, smooth texture, and appropriate pH suitable for scalp application. Stability studies showed no significant changes in color, odor, texture, or pH under different storage conditions, indicating good stability. The skin irritation test confirmed that the formulation was non-irritant and safe for topical use. Overall, the herbal hair mask demonstrated effective conditioning, moisturizing, and potential anti-dandruff and hair-strengthening properties. The study concludes that the formulated herbal hair mask is a safe, stable, and effective natural alternative for maintaining healthy hair.

INTRODUCTION

Hair promotes well-being in people and also protects the scalp from solar radiation and mechanical abrasion. The development of hair care formulations is important for the treatment and protection of the hair fiber from daily external hair aggressions. The primary functions of hair care

formulations improve the physical properties of the hair fiber, such as texture, strength, and combability. The secondary functions are the improvement of sensory properties, such as brightness, frizz reduction and hair film formation.^[1]

Hair is simple in structure made of the root and shaft. The root is enclosed in the hair follicle, hair shaft is the part of the hair seen above the skin. Hair

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is made up of tough protein called keratin that forms the strength of hair. Keratin is a large molecule made up of smaller units called amino acids, which join together to form a chain. Hair structure is made up of different layers and

structures. The hair follicle is the centre of the biological activity like hair growth, pigmentation; whereas the hair shaft is considered to be dead and is mainly made of protein.

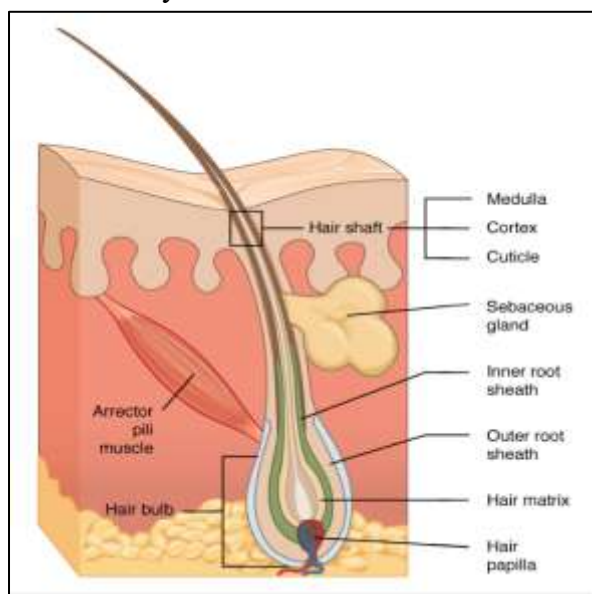


Fig No.1:- Structure of Hair

Hair grows from the follicle, or root, underneath the skin. The hair is 'fed' by blood vessels at the base of the follicle, which give it the nourishment it needs to grow. Between starting to grow and falling out years later, each hair passes through four stages: anagen, catagen, telogen and exogen. Another stage kenogen, has been recently realised. Every hair is at a different stage of the growth

cycle. Over time, the length of the anagen stage decreases. Therefore, the hair may become weaker and thinner after each cycle. That is why it is important to ensure diet rich in specific nutrients to maintain normal, healthy hair growth. If hairs enter the resting phase too early, excess shedding and noticeable thinning of the hair can occur.^[2]



Fig No.2 :- Stages of Hair Growth

1.1 PROBLEM RELATED TO HAIR^[3]

1.2 Dandruff :- It is mainly caused by the overgrowth of a yeast-like fungus called

Malassezia on the scalp, leading to irritation and flaking.

Dry hair :- Dry hair is caused by insufficient moisture or natural oils in the hair shaft due to factors like environmental damage, excessive heat styling, or reduced sebum production.

Oily hair :- Oily hair is caused by overactive sebaceous glands producing excess sebum on the scalp, leading to greasy hair.

Frizzy hair :- Frizzy hair is caused by a lack of moisture in the hair cuticle, leading it to absorb humidity from the air and swell unevenly.

Grey hair :- Grey hair is caused by a reduction in melanin production in hair follicles, often due to aging, genetics, or oxidative stress.

1.2 Importance of Herbal Cosmetics and Their Demand in the Market

In the history of cosmetics, Egyptians were known to recognize the benefits of cosmetics in the early days. Earlier natural and herbal products were predominantly used to enhance skin tone, radiance, hair growth, fragrance, and various dermatological conditions.^[6] Later in the 19th century, the chemical formulation known as cosmetics became popular over time since it was proven to give the same effect as that of natural products for improving beauty and appearance.^[7] The Discovery of hydroxyl acids used against wrinkles marked the rapid expansion of the cosmeceutical industry. Raymond Reed, the founder of the United States Society of Cosmetic chemists coined the term cosmeceuticals. Albert M Kligman in 1970, used retinoic acid in a formulation to improve the appearance of skin damaged by ultraviolet (UV) radiation and wrinkles.^[8,9] Although the cosmetics improved the appearance, their extensive use leads to severe side effects such as endocrine disorders, cosmetic-linked melanoma, stillbirths, birth defects, even severe lung diseases,^[10] which led to change over from chemicals to natural or herbal

extracts.^[5] Considering these side effects, the cosmeceutical industries started working on a stable formulation containing natural and herbal extracts (ingredients) in place of chemicals that had mere side effects compared to cosmetics, hence herbal cosmeceuticals became a current trend again in the market.^[4] The zero or mere side effects from the herbal cosmeceuticals gained the trust of customers and hence boomed in the market.^[11] Now the herbal cosmeceuticals used are in more demand worldwide compared to synthetic cosmeceuticals.^[12]

1.3 Herbal Hair Mask

Herbal hair mask formulations are designed to cleanse, change the texture, change the colour, revitalize stressed hair, nourish hair, and give hair a healthy appearance are all considered hair cosmetics. Hair types vary from person to person and include dry hair, greasy hair, as well as normal hair. Nowadays, people don't have time to think about how they look problems relating to hair, such as split ends, dandruff, white hair, hair loss, etc. Hair issues are brought on by stress, infections of the scalp, hormone imbalances, inadequate consumption of vitamins, food, and minerals, and overuse of chemical shampoos.^[13-14] Products that are used for cleaning, texture modification, color change, revitalizing stressed hair, nourishing hair, and giving hair a healthy appearance are referred to as hair care products. Dandruff is a significant and prevalent issue these days that is brought on by these products used in daily life. The main purposes of hair care formulas are to enhance the physical characteristics of the hair fiber, including its strength, and texture. The enhancement of sensory qualities like brightness, frizz reduction, and hair film development are the secondary purposes.^[15] It has cultural and aesthetic value in addition to being crucial in protecting the scalp from the elements such the sun and cold. These days, maintaining a clean scalp and hair is one of



the most important parts of one's personal life. The hair is the most important part of the body. We therefore created a hair mask, hair shampoo and hair serum formula, to take care of them. The advantages of the herbal hair mask's ingredients for Hair are well-known. Vitamin E, coconut oils are also included in the hair mask, hair serum and shampoo and are applied to the hair. These herbal hair products are made without the use of any chemicals. Since it only contains natural ingredients, it doesn't harm your hair. Hair is a sign of excellent health and a sensitive organ. We might use an herbal hair mask to help hydrate our hair. They are extremely beneficial for dry and damaged hair. Adopting a healthy lifestyle and selecting products containing these elements support the general health of hair. ^[16] Our scalp's health and the strength of our hair can both be enhanced by a hair mask. These hair products are made at home, are very beneficial, and have no side effects. Many materials can be used to create these products. These products are very beneficial for persons whose hair is severely damaged or extremely thin. Our personalities are more attractive when we have nice hair. Although there are many different types of masks available, many of them contain chemicals. Thus, we produced a product using herbs. The process of creating hair mask, shampoo and serum is very easy. Herbs are widely used as therapeutic agents due to their affordability, accessibility, and safety. The global market is seeing an increase in demand for herbal formulations. The main objective of our study was to fully resolve this difficulty. For hair care, we therefore developed a multifunctional herbal anti-dandruff, conditioning, and anti-hair fall mask. ^[17]

2. PLANT PROFILE OF INGREDIENT

2.1 Flax Seeds



Fig No.3:-Flaxseed

Biological Source: *Linum usitatissimum* Linn.

Family: *Liliaceae*.

Kingdom: Plantae (Plants).

Subkingdom: Trophobiont (Vascular Plant).

Subdivision: Spermatophyta (Seed Plant).

Division: Magnoliophyta.

Class: Magnoliopsida (Dicotyledons).

Subclass: Rosidae.

Genus: *Linum* L.

Species: *Usitatissimum* L.

Constituents

The flax seeds contain 35-45% oil which contain 9-10% of saturated fatty acids (palmitic and steric) about 20% monosaturated fatty acids (mainly oleic acid), and more than 70% alpha-linolenic acid fatty acid. The protein content in the seed of flax varies from 20-30.

Uses

Flax seeds is the power house of nutrients, vitamins and

healthy fats, all of which may help to:

Teart The Scalp

Prevent The Hair Loss

Promote Hair Growth^[18,19]

2.2 Aloe Vera





Fig No.4:- Aloe Vera

Family: *Asphodelaceae*

Biological Source: *Aloe perryi*

Subfamily: *Asphodelodeae*

Kingdom: *Plantae*

Class: *Liliopida-Monocotyledons*

Order: *Liliales*

Genus: *Aloes*

Constituent

The gel of Aloe vera contains polysaccharides like acemannan that provide moisturizing and healing effects. It is rich in vitamins A, C, E, and B-complex, along with enzymes such as amylase and lipase. Anthraquinones like aloin offer antimicrobial action, while saponins provide cleansing properties. It also contains lignin for better penetration, salicylic acid for anti-inflammatory effects, and minerals like calcium, magnesium, and zinc.

Uses

Aloe vera is most beneficial for our hair.

It helps to stop the hair fall.

It repairs dead skin cells on the scalp.

It gives shine to our hairs and it act as great conditioner and

leaves our hair all smooth and shiny.

It promotes the growth of hairs.

Aloe vera prevents itching on the scalp and reduces dandruff

and conditions our hair.^[20]

2.3 Hibiscus



Fig No.5:- Hibiscus

Biological Source: *Hibiscus rosa-sinensis*

Family: *Malvaceae*

Kingdom: *Plantae*

Division: *Tracheophyte*

Class: *Magnoliopsida*

Genus: *Hibiscus L*

Species: *Rosa Sinensis L*

Constituents

The leaves and flowers of *Hibiscus rosa-sinensis* contain flavonoids and anthocyanins with strong antioxidant activity. It is rich in mucilage, which provides moisturizing and conditioning effects. Tannins offer astringent properties, while saponins aid in gentle cleansing. The plant also contains organic acids like citric and malic acid for pH balance, along with vitamins (C and A) and minerals such as calcium and iron that support scalp and hair health.

Uses

Promotes hair growth

Reduces hair fall

Prevents dandruff

Acts as a natural hair conditioner

Delays premature greying^[21]

2.4 Fenugreek Seeds



Fig No.6:-Fenugreek Seeds

Botanical Name: *Triglmellafoenum-graecum*

Family: [Fabaceae](#)

Kingdom: Plantae

Division: Magnoliophyta

Class: Mangnoliopsida

Family: Fabaceae

Genus: Trigonella

Species: *Foenum-graecum* Linn

Constituents

Fenugreek seeds contain a rich variety of bioactive constituents, including alkaloids (trigonelline), steroidal saponins (diosgenin), flavonoids, and glycosides. They are also high in dietary fiber, proteins, and essential amino acids like lysine and tryptophan. The seeds contain vitamins such as

vitamin A, B-complex, and C, along with minerals like iron, calcium, and phosphorus. Additionally, mucilage compounds contribute to their soothing and moisturizing properties, especially in hair and skin applications.

Uses

Promotes hair growth and strengthens hair

Reduces dandruff and conditions dry scalp

Helps control blood sugar levels

Aids digestion and relieves constipation

Lowers cholesterol levels^[22]

3. AIM AND OBJECTIVE

Aim:-Formulation and evaluation of herbal hair mask

Objective:- The objective of formulating and evaluating a herbal hair mask is to develop a safe, effective, and natural alternative to synthetic hair care products using plant-based ingredients. The formulation aims to promote hair growth, reduce dandruff, nourish the scalp, and improve hair texture and strength. Evaluation parameters include physical appearance, pH, consistency, spreadability, stability, and microbial safety. Additionally, the study assesses its effectiveness in conditioning, and enhancing overall hair health, ensuring the product is stable, user-friendly, and suitable for regular use without adverse effects.

4. MATERIALS AND METHOD

Table no.1:-The Ingredient used in herbal hair mask

Sr. No.	Ingredient	Uses
1.	Flaxseed Mucilage	Conditioning
2.	Fenugreek Seed Mucilage	Strengthening
3.	Aloe Vera Gel	Moisturizing
4.	Hibiscus Mucilage	Nourishing
5.	Carbopol 940	Thickning
6.	Sodium Benzoate	Preservative
7.	TEA(Triethanolamine)	Neutralizer/pH Adjuster



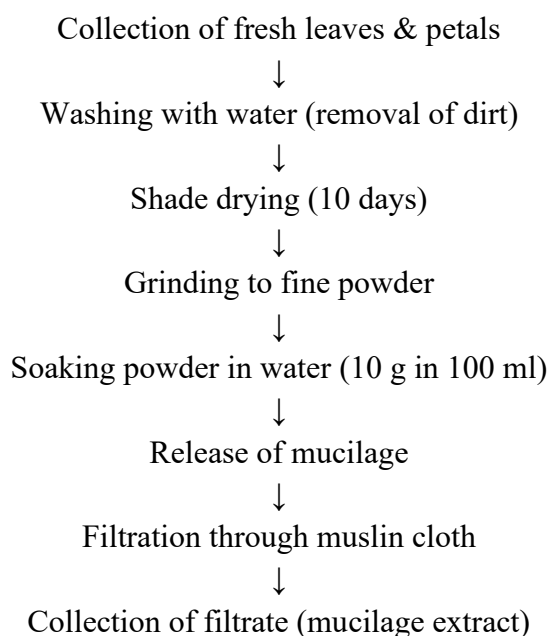
8.	Glycerin	Hydrating
9.	Lavender Oil	Fragrance
10.	Distilled Water	Solvent



Fig No.7:-Chemicals

4.1 Extraction of Hibiscus Mucilage:

Flow Chart: Extraction of Mucilage from *Hibiscus rosa-sinensis*



4.2 Preparation of Flaxseed Mucilage:

Added the flaxseeds to the water.

Boiled this water for around 10 min. and keep stirring to avoid flaxseeds from sticking to the base.

Let the gel cooled down.

Put the muslin cloth in a glass measuring cylinder to strain it.

4.3 Preparation of Fenugreek Mucilage:

Soak the fenugreek seeds in hot water.

Allow to soak for 3-4 hours or overnight.

Heat the soaked mixture gently for 5-10 minutes to enhance mucilage release.

Grind the soaked fenugreek seeds into a smooth paste.

Filter through muslin cloth to extract smooth mucilage, if a clearer gel is desired.

Table no.2:- List of Instrument used

Sr. No.	Instruments
1	Electric pH Meter
2	Homogenizer
3	Auto Clave
4	Incubator
5	Hot air oven
6	Weighing Balance

Table no.3:- List of apparatus used

Sr.No	Apparatus
1	Beakers
2	Glass rod
3	Tripod stand
4	Waterbath
5	Mortar & pestel
6	Pair of tongs
7	Measuring cylinder
8	Glass slides
9	Petriplates
10	Weight Box
11	Spatula



Table no.4:- Composition of batches

Sr. No	Ingredients	F1	F2	F3	F4	F5
1	Flaxseed Mucilage	20g	25g	22 g	24 g	23 g
2	Fenugreek Seed Mucilage	15g	15g	16 g	14 g	15 g
3	Aloe Vera Gel	20g	20g	22 g	21 g	19 g
4	Hibiscus Mucilage	10g	10g	11 g	9 g	10 g
5	Carbopol 940	1g	1g	1 g	1 g	1 g
6	Sodium Benzoate	0.5g	0.5g	0.5 g	0.5 g	0.5 g
7	TEA(Triethanolamine)	2-3 drops	2-3 drops	2-3 drops	2-3 drops	2-3 drops
8	Glycerin	5g	5g	5g	5g	5g
9	Distilled Water	q.s	q.s	q.s	q.s	q.s

4.4 Formulation Method of Herbal hair mask

Step 1: Preparation of Gel Base^[24]

Take a required quantity of distilled water in a clean beaker.

Add Carbopol 940 (0.5–1%) slowly with continuous stirring using a glass rod to avoid lump formation.

Allow it to hydrate for 1–2 hours until a uniform dispersion is obtained.

Step 2: Addition of Humectant and Preservative^[23]

Add glycerin (5–10%) to the hydrated Carbopol dispersion and mix thoroughly.

Dissolve sodium benzoate (0.2–0.5%) in a small amount of distilled water and add to the mixture with continuous stirring.

Step 3: Incorporation of Herbal Mucilage^[23]

Add the following gels one by one with continuous stirring:

Flaxseed mucilage

Fenugreek seed mucilage

Aloe vera gel

Hibiscus mucilage

Mix using a homogenizer to obtain a smooth and uniform consistency.



Fig No.8:- Homogenizer

Step 4: Neutralization and Gel Formation^[23]

Add Triethanolamine (TEA) dropwise while stirring.

Continue until the formulation thickens and forms a clear gel.

Adjust pH to 5.5–6.5 using a pH meter.

Step 5: Final Mixing

Stir the formulation continuously to ensure uniform distribution of all ingredients.

Remove any entrapped air by allowing the gel to stand undisturbed.

Step 6: Filling and Storage

Transfer the prepared gel into clean, airtight containers.



Store at room temperature away from direct sunlight.

5. EVALUATION PARAMETERS

5.1 Organoleptic Properties

In this test, the hair mask was observed for colour, odour, texture, etc.

Colour: Reddish

Odour: Pleasant, characteristic lavender odour

Apperance:Gel

5.2 pH test

The pH of the herbal hair mask formulations was measured using a calibrated digital pH meter. A 1% aqueous solution of each formulation was prepared using distilled water, and the pH was recorded at room temperature. The pH values were found within the range of 5.5–6.5, which is suitable for scalp application and helps maintain the natural balance of hair and scalp.



Fig No.9:-pH Meter

5.3 Spreadability Test

The Spreadability was expressed in terms of time in seconds taken by two glass plates to slip off from the formulation, placed in between the plates, under certain load lesser the time taken for separation of the two glass plates better the Spreadability. Two sets of glass plates of standard dimension were taken. Then one plates of suitable dimension was taken and the formulation was placed on that plate. Then other plate was placed

on the top of the formulation. Then a weigh of 20g was placed on the upper plate so that the formulation between the two plates was pressed uniformly to form a thin layer.

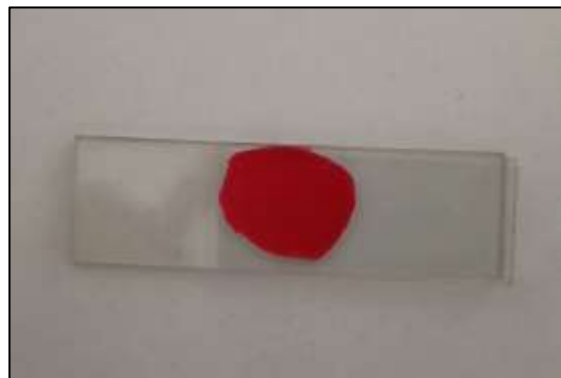


Fig No.10:- Spreadability Test

5.4 Stability Studies

The formulation was stored for some time under different temperatures (35°C to 40°C) and humidity conditions and the change in the physical properties was not observed.

Table No.5:-Stability studies

Sr No	Parameter	Result
1	Change in colour	No change
2	Change in odor	No change
3	Change in texture	No change
4	Change in pH	No change

5.5 Skin irritation test

Mark the area (1cm) on left hand surface, then the mask was applied to the area and the time was noted. This is checked for irritancy, erema if any for an interval up to 24 hr and reported.



Fig No.11:- Skin irritation test

5.6 Comparative Study of Formulation Batches

A comparative evaluation of all formulation batches (F1–F5) was carried out to identify the optimized herbal hair mask formulation. Variations in the concentration of flaxseed mucilage, fenugreek mucilage, aloe vera gel, and hibiscus mucilage influenced the physicochemical characteristics of the formulations.

F1 showed good stability and acceptable performance but comparatively lower spreadability and consistency than F2. F3 demonstrated very good texture and overall performance; however, its spreadability and

acceptability were slightly lower than F2. F4 exhibited a thicker consistency and moderate spreadability, which affected ease of application and overall acceptability. F5 showed satisfactory stability and performance but did not match the uniform texture and ideal consistency observed in F2. Among all batches, F2 demonstrated the most balanced formulation with excellent spreadability, smooth and uniform texture, ideal pH, superior stability, pleasant odor, and better washability. Therefore, F2 was selected as the optimized formulation for the herbal hair mask preparation.

Table No.6:- Comparative Study of Formulation Batches

Evaluation Parameters	F1	F2	F3	F4	F5
Color	Light reddish brown	Reddish brown	Brownish red	Dark reddish brown	Reddish brown
Texture	Smooth	Smooth & uniform	Smooth	Slightly thick	Smooth
Odor	Pleasant	Pleasant	Pleasant	Slightly strong	Pleasant
pH	5.7	5.9	6.0	6.1	6.3
Spreadability	Good	Excellent	Very good	Moderate	Good
Stability	Stable	Highly stable	Stable	Stable	Stable
Skin Irritation	Not observed	Not observed	Not observed	Mild redness absent	Not observed
Consistency	Good	Excellent	Very good	Thick	Good
Washability	Good	Excellent	Good	Moderate	Good
Overall Performance	Stable & effective	Highly stable & effective	Stable & effective	Effective	Stable & effective
Overall Acceptability	Good	Excellent	Very good	Good	Very good

6. RESULT AND DISCUSSION

6.1 RESULT

All five formulations (F1–F5) of the polyherbal hair mask were successfully prepared and evaluated for various physicochemical parameters such as color, texture, odor, pH, spreadability,

stability, consistency, washability, skin irritation, overall performance, and acceptability. The formulations showed satisfactory characteristics with no significant irritation or instability observed during evaluation. Among all formulations, F2 exhibited the best overall performance.

It showed a reddish-brown appearance with a smooth and uniform texture, pleasant odor, ideal



pH (5.9), excellent spreadability, good consistency, superior washability, and high stability. No skin irritation was observed with F2, indicating its safety for topical application. The formulation also demonstrated better overall acceptability compared to the other formulations. Hence, based on the evaluation parameters, F2 was considered the optimized and ideal formulation for the herbal hair mask preparation due to its superior physicochemical properties, stability, ease of application, and user acceptability.

6.2 DISCUSSION

The present study demonstrated the successful formulation and evaluation of a polyherbal hair mask using natural ingredients such as flaxseed mucilage, fenugreek mucilage, aloe vera gel, and hibiscus mucilage. These herbal ingredients are well known for their nourishing, moisturizing, conditioning, and hair-strengthening properties, which contributed to the effectiveness of the formulation. All prepared batches showed acceptable physicochemical characteristics including pleasant odor, smooth texture, good consistency, and satisfactory spreadability, making them suitable for topical application. The pH of all formulations was found within the suitable range for scalp application, indicating compatibility with the natural scalp environment and minimizing the risk of irritation. Stability studies confirmed that the formulations remained stable under different temperature conditions without any significant changes in color, odor, texture, or pH. Skin irritation studies revealed that the formulations were safe and non-irritant.

Among all formulations, F2 showed the best overall performance due to its smooth and uniform texture, excellent spreadability, better washability, ideal pH, and higher stability. The comparative study indicated that slight variations in the concentration of herbal ingredients influenced the

overall quality and acceptability of the formulations. Overall, the study suggests that the developed herbal hair mask can serve as a safe, effective, and natural alternative to synthetic hair care products.

7. SUMMARY AND CONCLUSION

7.1 SUMMARY

The present study focused on the formulation and evaluation of a polyherbal hair mask using natural ingredients such as flaxseed mucilage, fenugreek mucilage, aloe vera gel, and hibiscus mucilage. The formulations were prepared using Carbopol 940 as a gelling agent along with glycerin, sodium benzoate, and triethanolamine. Different formulation batches (F1–F5) were developed and evaluated for various physicochemical parameters including color, odor, texture, pH, spreadability, consistency, stability, washability, skin irritation, and overall acceptability.

The prepared formulations showed satisfactory results with good appearance, suitable pH, smooth consistency, and stability under different storage conditions. No significant skin irritation was observed, indicating that the formulations were safe for topical application. Comparative evaluation revealed that F2 showed the best performance among all batches due to its excellent spreadability, uniform texture, ideal pH, high stability, and better overall acceptability. The study concluded that the formulated herbal hair mask is a stable, safe, and effective natural hair care preparation that may help in conditioning, nourishing, and improving overall hair health.

CONCLUSION

The present study concluded that the formulated polyherbal hair mask is a safe, stable, and effective natural alternative to synthetic hair care products. The combination of flaxseed mucilage, fenugreek



mucilage, aloe vera gel, and hibiscus mucilage provided beneficial effects such as nourishment, conditioning, moisturization, and improvement in overall hair health. All formulations showed satisfactory physicochemical properties including suitable pH, good spreadability, stability, and non-irritant nature.

Among all formulation batches, F2 was found to be the optimized formulation due to its excellent consistency, smooth texture, ideal pH, better spreadability, high stability, and superior overall acceptability. The study suggests that the developed herbal hair mask can be effectively used for regular hair care with minimal side effects. Therefore, the formulation has good potential for use as a herbal cosmetic preparation for maintaining healthy and nourished hair.

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FORMULATION AND EVALUATION OF CREAM FOR HYPOPIGMENTATION

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ABSTRACT

Skin pigmentation is a natural phenomenon that plays an important part in the appearance and biology of all animals including humans. The process of melanogenesis, which results in the formation of the pigment melanin within melanocytes, determines skin color. Disturbance in these pathway leads to different skin disorders like hypopigmentation, leukoderma, vitiligo etc. Hypopigmentation is a skin condition characterized by reduced or absent melanin production, leading to light or white patches on the skin. It may arise due to genetic factors, autoimmune disorders, infections, skin injury or exposure to chemicals. Common examples include vitiligo and post-inflammatory hypopigmentation. Conventional synthetic treatments such as corticosteroids, calcineurin inhibitors, and psoralen-based therapies are used, but prolonged use may cause irritation, erythema, skin thinning, and photosensitivity. The present study focuses on the formulation and evaluation of an herbal cream for management of hypopigmentation. The formulation includes bakuchi oil, Turmeric extract,Neem extract, Aloe vera incorporated into a suitable cream base. The prepared cream was evaluated for pH, viscosity, spreadability, homogeneity, stability and appearance. The herbal ingredients used are known to promote melanocyte activity and provide antioxidant and anti-inflammatory benefits. Based on the findings, the herbal formulation can be consider as a safe, effective, and economical alternatives to synthetic treatments with improved patient acceptability and minimal side effects, offering potential benefits in long-term management of hypopigmentation.

KEYWORDS: Hypopigmentation, Herbal cream, Bakuchi oil, Melanin, Antioxidant, Topical formulation.

INTRODUCTION

Skin is the largest organ of human body and plays crucial role in protection, thermoregulation, and sensory perception. One of its defending features is pigmentation, which determines skin colour and is primarily governed by the pigment melanin.^[1] Melanin is synthesized by specialized cells known as melanocytes, located in the basal layer of the epidermis. the process of melanin production, called melanogenesis, involves the enzyme tyrosinase, which catalyzes the conversion of tyrosine into melanin.^[2] This pigment not only provides color to the skin, hair, and eyes but also protects against harmful ultraviolet (UV) radiation by absorbing and dissipating it. Any disruption in melanocyte function or melanin synthesis can lead to pigmentation disorders.^[3]

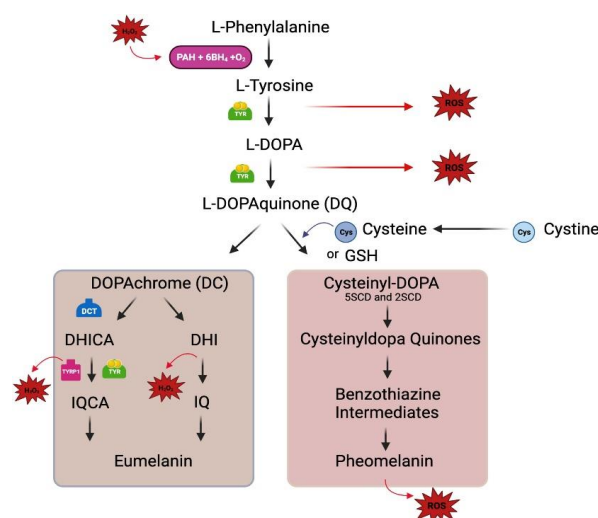


Fig. 1: Melanin Synthesis Pathway.

Hypopigmentation results from interruptions in melanogenesis, the process by which melanin is produced and delivered to keratinocytes.^[4] These disruptions lead to lower melanin levels and can occur through several mechanisms, such as suppression of tyrosinase (the key enzyme in melanin formation), defects in melanosome development or movement (as seen in albinism), or immune-driven melanocyte loss (as in vitiligo). The final outcome is reduced production of both eumelanin and pheomelanin.^[5]

Main Points of Disruption in the Pathway

Decreased Tyrosinase Function: Tyrosinase catalyzes the conversion of tyrosine to DOPA and then to dopaquinone, which is essential for melanin formation. When tyrosinase activity is lowered, this initial step is blocked, stopping the production of both dark (eumelanin) and light (pheomelanin) pigments.

Melanosome Abnormalities: Problems in the formation, movement, or transfer of melanosomes—the organelles that carry pigment—from melanocytes to keratinocytes cause hypopigmentation. These issues are often linked to rare genetic disorders such as Hermansky-Pudlak syndrome and Chediak-Higashi syndrome.

Oxidative Stress and Immune Involvement: High levels of oxidative stress, including the buildup of hydrogen peroxide, can break down melanin and damage melanocytes. This stress may also trigger immune responses, such as attacks by CD8⁺ T cells, leading to melanocyte destruction in vitiligo.

Disrupted Signaling Pathways: Interference with signaling routes like the α -MSH/MC1R pathway, which regulates tyrosinase production and melanosome formation, can reduce melanin synthesis.^[5] Among these, hypopigmentation is a commonly observed condition characterized by partial or complete loss of skin colour. It appears as lighter patches or areas on the skin compared to the surrounding normal skin tone. Hypopigmentation may result from a decrease in melanin production, destruction of melanocyte, or impaired transfer of melanin to keratinocytes.^[6] Common types of hypopigmentation include vitiligo, post-inflammatory hypopigmentation, tinea versicolor, and genetic conditions such as albinism. These conditions may arise due to various factors such as autoimmune responses, infections, exposure to chemicals, nutritional deficiencies, and environmental stressors.^[7] Hypopigmentation not only affects physical appearance but also has significant psychological and emotional consequences. Individual suffering from visible skin disorders often experience and safe treatment of hypopigmentation is of great importance in both dermatological and cosmetic fields.^[8]



Fig. 2: Hypopigmentation.

Types of Hypopigmentation

Vitiligo: An autoimmune condition causing progressive, distinct white patches on the skin, often around body openings.

Post-Inflammatory Hypopigmentation (PIH): Temporary light spots that develop after skin inflammation, such as acne, eczema, or psoriasis.

Pityriasis Alba: Common in children, this condition presents as mild, scaly, light-colored patches, usually on the cheeks.

Tinea Versicolor: A fungal infection that causes scaly, light, or dark spots on the trunk, neck, and arms, often appearing in warm, humid conditions.

Idiopathic Guttate Hypomelanosis (IGH): Small, white, sun-damaged spots that appear on the arms and legs, often related to aging.

Albinism: A genetic condition causing a significant reduction or absence of melanin, affecting the skin, hair, and eyes.

Progressive Macular Hypomelanosis: A condition characterized by increasing numbers of asymptomatic, non-scaly white spots, often on the trunk, caused by *Cutibacterium acnes* bacteria.^[9]

Currently, several conventional treatments are available for managing hypopigmentation. These include topical corticosteroids, calcineurin inhibitors such as tacrolimus, psoralen combined with ultraviolet A (PUVA) therapy, narrowband UVB phototherapy, and skin grafting techniques in severe cases. Additionally, synthetic topical formulations containing chemicals that stimulate melanogenesis are widely used. While these treatments can provide improvement in certain cases, they are often associated with limitations such as high cost, time-consuming procedures, inconsistent results, and potential side effects. Long-term use of corticosteroids may cause skin thinning, irritation, and increased susceptibility to infections. Phototherapy, although effective, requires repeated clinical visits and may increase the risk of skin damage with prolonged exposure.^[10] Due to these drawbacks, there has been a growing interest in alternative approaches, particularly herbal and natural formulations, for the treatment of hypopigmentation. Herbal medicine has been used for centuries in traditional systems such as Ayurveda for managing various skin disorders.^[11] Herbal formulation is gaining popularity because of their safety, affordability, and minimal side effects compared to synthetic drugs. They contain a wide variety of bioactive compounds such as flavonoids, alkaloids, glycosides, terpenoids, and phenolic compounds, which exhibit diverse pharmacological activities including antioxidant, anti-

inflammatory, antimicrobial, and melanocyte-stimulating effects. One of the key mechanisms by which herbal ingredients help in treating hypopigmentation is by enhancing melanogenesis.^[12] Certain plant-derived compounds can activate tyrosinase enzyme activity, stimulate melanocyte proliferation, and promote the transfer of melanin to skin cells. Additionally,

antioxidants present in herbal extract protect melanocytes from oxidative stress, which is one of the major causes of pigment loss. Anti-inflammatory properties further aid in reducing skin damage and promoting regeneration. Several medicinal plants have been traditionally used for restoring skin pigmentation.^[13]



Fig. 3: Bakuchi Plant.



Fig. 4: Neem.



Fig. 5: Mango ginger.



Fig. 6: Aloe Vera.

Bakuchi (*Psoralea corylifolia*) is one of the most important herbs known for its effectiveness in treating vitiligo and hypopigmented conditions. It contains active constituents such as psoralen and bakuchinol, which increase melanin production when exposed to sunlight or UV radiation.^[14] **Mango ginger (*Curcuma amada*)** is widely known for its anti-inflammatory and antioxidant properties due to the presence of curcumin, which helps in protecting skin cells and promoting healing.^[15] **Neem (*Azadirachta indica*)** exhibits strong antimicrobial and immunomodulatory activities, making it useful in preventing infections and supporting skin health. **Aloe vera (*Aloe barbadensis*)** is rich in vitamins, enzymes, and polysaccharides that provide soothing, moisturizing, and regenerative effects on the skin.^[16] The combination of these herbal ingredients in a suitable formulation can provide a synergistic effect, enhancing their overall therapeutic efficacy. Herbal creams, gels, and ointment are commonly preferred dosage forms due to their ease of application, better patient compliance, and targeted delivery to the affected area. Such formulation not only help in restoring pigmentation but also improve overall skin texture and health.^[17] The present study is focused

on the development and evaluation of an herbal formulation for the treatment of hypopigmentation.^[18] The aim is to prepare a stable and effective topical formulation using selected medicinal plant extract known for their melanogenic and skin-protective properties. The study also aims to evaluate the physicochemical characteristics of the formulation, such as pH, viscosity, spreadability, and stability, along with its therapeutic potential. By utilizing natural ingredients, the objective is to develop a formulation that is safe, economical, and effective, offering a promising alternative to conventional synthetic treatments for hypopigmentation.^[19]

AIM: To formulate and evaluate a herbal cream for the treatment of Hypopigmentation using natural ingredients such as Bakuchi Oil, Mango Ginger, Aloe Vera And Neem.

OBJECTIVES: To formulate a polyherbal cream for hypopigmentation, To evaluate its physicochemical properties, To study the stability of the formulation, To assess its skin compatibility and safety.

MATERIALS AND METHODS

Table 1: Hypopigmentation Cream Ingredients.^[20]

Sr.no	Ingredients	Role
1	Bakuchi oil	Stimulates melanocytes and increase melanin production
2	Mango ginger	Reduce inflammation and promote skin healing
3	Neem	Provide antioxidant and antimicrobial protection to melanocytes
4	Aloe vera	Moisturizes skin and enhance penetration of active ingredients
5	Bees wax	Emulsifying and thickening agent
6	Cetyl alcohol	Emollient , prevent phase separation
7	Liquid paraffin	Lubricating agent
8	Methyl paraben	Preservative
9	Rose oil	Fragrance
10	Distilled water	Vehicle

Methods

For mango ginger and neem we used Hydroalcoholic Maceration Method

A. Extraction of Curcumin:- Fresh rhizomes of mango ginger are washed thoroughly to remove dirt and impurities. The cleaned rhizomes are cut into small pieces and dried under shade for several days until moisture is removed. The dried material is then powdered using a grinder to obtain a coarse powder. About 10 g of powdered drug is transferred into a clean conical flask. Add 100 mL of hydroalcoholic solvent to the flask. The mixture is kept for 48–72 hours at room temperature with occasional shaking to ensure proper extraction. After maceration, the mixture is filtered using filter paper. The filtrate obtained is concentrated by evaporating the solvent on a water bath at low temperature. The concentrated extract is collected and stored in an airtight container for further use.^[21]

B. Extraction of Neem:- Fresh neem leaves were collected and washed thoroughly with water to remove impurities. The leaves were shade dried for 5–7 days until complete removal of moisture. The dried leaves were coarsely powdered using a grinder. About 10 g of powdered neem leaves was weighed and transferred into a conical flask. 100 mL of hydroalcoholic solvent was added. The flask was tightly closed and kept for 48–72 hours for maceration at room temperature. The mixture was shaken occasionally to enhance extraction. After maceration, the mixture was filtered using Whatman filter paper. The filtrate obtained was concentrated by evaporating the solvent on a water bath. A semi-liquid extract was obtained and collected. The extract was stored in an airtight container for further use.^[22]



Fig. 7: Maceration.



Fig. 8: Final Extract.

C) Cream Base Preparation By Fusion Method

Preparation of Oil Phase:- Beeswax, cetyl alcohol, and liquid paraffin were accurately weighed and taken in a clean beaker. The mixture was heated on a water bath at 70–75°C until all ingredients melted completely.

Preparation of Aqueous Phase:- In another beaker, distilled water was taken and heated to the same temperature. Preservatives (methyl paraben and propyl paraben) were dissolved in the warm aqueous phase.

Emulsification:- The hot aqueous phase was slowly added to the oil phase with continuous stirring. Stirring was continued until a uniform emulsion was formed.

Cooling:- The prepared emulsion was allowed to cool gradually with constant stirring to obtain a smooth and stable cream base.

Storage:- The cream base was transferred into a clean, dry container and stored in a cool and dry place for further use.

D) Incorporation of Active Ingredients

The prepared cream base was allowed to cool to about 40°C.

Required quantities of active ingredients such as Bakuchi oil, Aloe vera gel, Neem extract, Mango Ginger extract were accurately measured.

The active ingredients were added slowly to the cream base with continuous stirring.

Mixing was continued until a uniform and homogenous cream was obtained.

Care was taken to avoid formation of lumps and ensure even distribution of all ingredients.

A small quantity of fragrance was added and mixed thoroughly.

The final formulation was transferred into suitable containers and stored in a cool and dry place.^[23]

Evaluation parameters

1. Organoleptic Assessment:- The prepared cream was visually examined for color, odor, texture, and

homogeneity. The presence of any lumps or phase separation was observed.

2. Physical assessment

a) pH Determination:- About 1 g of cream was dissolved in 10 mL distilled water. The pH was measured using a digital pH meter. Ideal Range: pH should be between 5–7 (skin compatible)

b) Determination Spreadability:- A small amount of cream was placed between two glass slides. A known weight was placed on the upper slide. The time taken for the slides to slip apart was noted.

c) Washability Determination:- A small amount of cream was applied on the skin. It was washed with water to check ease of removal.

d) Irritancy Test:- The cream was applied on a small area of skin (hand). The area was observed for 24 hours for redness, itching, or irritation.

e) Homogeneity:- A small quantity of the prepared cream was taken in a clean beaker. The sample was subjected to mixing using a homogenizer at a suitable speed for a few minutes. After homogenization, the cream was observed visually for uniformity and smoothness. The presence of any lumps, coarse particles, or phase separation was checked.

f) Stability Study:- The cream was stored at different conditions: Room temperature, Refrigerated condition. Observed for color change, phase separation, or odor change over time.^{[24],[25]}

Table 2: Formulation of cream batches by Trial and Error Method.

Sr.no	Ingredient used	F1	F2	F3
1	Bakuchi oil [ml]	0.5ml	1ml	1.5ml
2	Neem extract [ml]	1ml	1.5ml	2ml
3	Mango ginger extract [ml]	1ml	1.5ml	2ml
4	Aloe vera [g]	2g	3g	5g
5	Bees wax [g]	5g	6g	7g
6	Cetyl alcohol [g]	1.5g	1.5g	1.5g
7	Liquid paraffin [ml]	25ml	27ml	30ml
8	Methyl paraben [g]	0.05g	0.05g	0.05g
9	Rose oil [q.s]	q.s.	q.s.	q.s.
10	Distilled water [q.s]	q.s to 50g	q.s to 50g	q.s to 50g

Table 3: Optimize formulation of cream.

Sr.no	Ingredient	Quantity
1	Bakuchi oil [ml]	1ml
2	Neem extract [ml]	1.5ml
3	Mango ginger extract [ml]	1.5ml
4	Aloe vera [g]	3g
5	Bees wax [g]	6g
6	Cetyl alcohol [ml]	1.5g
7	Liquid paraffin [ml]	27ml
8	Methyl paraben [g]	0.05g
9	Rose oil [q.s]	q.s.
10	Distilled water [q.s]	q.s.to 50g

Experimental Work done**Fig 9:- Weighing Of Materials****Fig 10:- Melting of Oil and Water phase individually****Fig 12:- Continuous stirring****Fig 11:-Incorporation of water phase into oil phase****Fig 13:- Incorporation of active ingredients****Fig 14: let it cool**

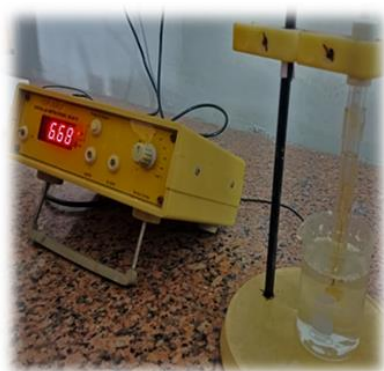


Fig 16:- pH of cream



Fig 15:- Application of Cream on Hand

[Process of Formulation of Cream]

RESULT AND DISCUSSION

Organoleptic evaluation of the prepared cream formulations (F1, F2, and F3) was carried out by visual inspection and sensory perception. The parameters evaluated included color, odour, appearance, texture, consistency, homogeneity, greasiness, phase separation, and washability. All three batches exhibited acceptable organoleptic properties. The color of the formulations ranged from pale yellow to yellowish cream, which is characteristic of the presence of herbal ingredients such as bakuchi oil. The odour of all batches was found to be pleasant, indicating suitability for topical application. The appearance of the creams was smooth, with batch F3 showing a slightly glossy nature. The texture of F1 and F2 was soft and smooth, whereas F3 was slightly thicker, possibly due to variation in ingredient concentration. All batches showed semi-solid consistency, with F3 being comparatively more viscous. Homogeneity was good in F1 and F2 formulations, indicating uniform distribution of ingredients without any lumps or aggregates. No phase separation was observed in any batch, which confirms the stability of the formulations. All

formulations were easily washable, although F3 required slightly more effort due to its thicker consistency.

The stability study of cream formulations F1, F2, F3 was carried out at 40°C and 4°C for 7 days to observe any changes in their properties during storage. At 40°C, slight changes were noticed in batches F1 and F2. There was minor variation in color, odor and pH. These changes may be due to the effect of higher temperature on the formulation, which can affect the consistency and overall stability of the cream. However, batch F2 did not show any noticeable change and remained stable under the same conditions. At refrigerated temperature 4°C, all batches remained stable. No change in color, odor, or appearance was observed. The pH of the formulation was also maintained, and no phase separation occurred. This indicates that lower temperature helps in maintaining the stability of the cream. The pH values of all batches remained within a suitable range for skin application. From the observation, it is clear that batch F2 showed better stability compared to F1 and F3 under both storage conditions. Therefore, F2 can be considered as the optimized and most stable formulation.

1. Organoleptic properties**Table 4: Organoleptic Evaluation Table.**

Sr.No.	Parameters	F1	F2	F3
1	Color	Pale Yellow	Pale Yellow	Yellowish
2	Texture Grade	Smooth	Smooth	Slightly Glossy
3	Odour	Pleasant	Pleasant	Slightly Pleasant
4	Visual Aspect	Homogenous	Homogenous	Not Completely Homogenous
5	Softness	Present	Present	Present

2. Physical evaluation**Table 5: Physical Evaluation Table.**

Sr.no.	Parameters	F1	F2	F3
1	Uniformity	Firm and consistent	Firm and consistent	Not uniform
2	pH	5.9	6.6	6.1
3	Ability to spread	Uniformly Spread	Uniformly Spread	Uniformly spread
4	Solubility	Water-insoluble	Water-insoluble	Water-insoluble
5	Absorption	Easily absorbs on skin	Easily absorbs on skin	Easily absorbs on skin
6	Emolliency	No residue is seen because of its softness	No residue is seen because of its softness	No residue is seen because of its softness

7	Phase separation	No phase separation	No phase separation	No phase separation
8	Ease of removal	Easily washable	Easily washable	Not easily washable
9	Irritancy	No irritancy was observed or feel	No irritancy was observed or feel	No irritancy was observed or feel

3. Stability study

Table 6: Stability study table.

Parameters	Batch	Initial	7days at room temperature	7 days at refrigerated condition
Color	F1	Pale yellow	No change	No change
	F2	Pale yellow	No change	No change
	F3	yellowish	No change	No change
Odor	F1	Pleasant	No change	No change
	F2	Pleasant	No change	No change
	F3	Pleasant	Slight change	No change
pH	F1	5.9	5.5	6.5
	F2	6.6	6.1	5.8
	F3	6.1	5.8	5.9
Phase separation	F1	Absent	Absent	Absent
	F2	Absent	Absent	Absent
	F3	Absent	Absent	Absent

SUMMARY AND CONCLUSION

Summary

The present study focused on the formulation and evaluation of a cream for hypopigmentation using suitable ingredients. Three different batches (F1, F2, and F3) were prepared by varying the concentration of components to obtain an optimized formulation. The prepared creams were evaluated for organoleptic properties such as color, odour, appearance, texture, consistency, homogeneity, greasiness, phase separation, and washability. All formulations showed satisfactory results with good physical appearance and stability. The creams were smooth, homogeneous, and free from any phase separation, indicating proper formulation and emulsification. Slight differences were observed among the batches in terms of texture and consistency, which may be due to variation in the concentration of waxes and oils. Overall, the formulations were found to be suitable for topical application.

CONCLUSION

From the present study, it can be concluded that all three cream formulations were successfully prepared and evaluated. The results showed that the formulations possessed acceptable organoleptic properties and good stability. Among the three batches, F2 showed better overall characteristics such as smooth texture, non-greasiness, and ease of application. Therefore, F2 can be considered as the optimized formulation for further studies. The developed cream has good potential for use in the management of hypopigmentation.

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FORMULATION AND EVALUATION OF HERBAL HAIR DYE GEL

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ABSTRACT

Herbal hair care products are becoming popular because they are safer and cause fewer side effects than chemical products. Chemical hair dyes can damage hair and irritate the scalp. So, this study aimed to prepare a herbal hair dye gel using natural ingredients like henna, amla, palash, hibiscus, and reetha. These ingredients help in coloring, cleaning, and strengthening the hair. The extracts of these herbs were prepared and mixed with a gel base made of Carbopol 940, glycerin, methyl paraben, triethanolamine, and distilled water. The prepared gel was evaluated for different parameters such as colour, smell, pH, viscosity, spreadability, homogeneity, and stability. The results showed that the gel had a suitable pH (around 6–7), good thickness, and was easy to apply on hair. It provided natural colour, improved hair texture, and helped in cleaning the scalp due to reetha. No irritation was observed and the gel remained stable during storage. Overall, the herbal hair dye gel was found to be safe, effective, and a good natural alternative to chemical hair dyes, with added benefits for hair health and scalp care.

KEYWORDS: Herbal hair dye gel, Henna, Amla, Palash, Hibiscus, Reetha, Natural hair color, Carbopol 940.

INTRODUCTION

Hair coloring or dyeing are methods of altering the color of one's hair. The main motivation for this is to recolor grey and white hair or to bring back the original color of hair that has been discolored by sun exposure or cosmetics. Herbal dyes have all of the benefits of natural substances. These formulations, in addition to working as a hair color, function as a hair growth stimulant and nourishment due to the right amalgamation of herbs.^[1]

Herbal hair dye gel is a semi-solid cosmetic formulation prepared using natural plant-based ingredients to impart color while simultaneously nourishing the hair and scalp. Unlike synthetic dyes, these formulations are designed to minimize chemical damage and provide safer, long-term hair care benefits. The use of multiple herbs in a single preparation enhances effectiveness through synergistic action.

Key ingredients commonly include henna (*Lawsonia inermis*), palash (*Butea monosperma*), amla (*Phyllanthus emblica*), reetha (*Sapindus mukorossi*), and hibiscus (*Hibiscus rosa-sinensis*). Henna acts as a natural coloring

agent and conditioner, while palasha contributes additional coloring and antimicrobial properties. Amla is rich in vitamin C and antioxidants, promoting hair strength and preventing premature greying. Reetha serves as a natural cleanser due to its saponin content, helping remove dirt and excess oil. Hibiscus supports hair growth, conditioning, and scalp health. Together, these herbs help maintain scalp pH, improve texture, and provide a natural tint while addressing issues such as dandruff and hair fall.^[2,3]

HAIR DYE

A dye is a coloured substance that has a link with the fibre, fur, or hair. Hair colouring, often known as dyeing is the process of transforming one's hair colour. The key reasons for the use of hair dye gel in cosmetics is to conceal grey or white hair, to change to a more elegant or perfect hue, or to restore the natural hair colour after it has been discoloured through hairdressing techniques or solar bleaching. Hair dye makes the hair look thicker and voluminous. Balding and greying of hair affect approximately 70% of people over the age of 50. Some people experience age-related symptoms considerably

earlier than others. Greying begins on the scalp around the age of 40, first at the temples, then the beard, moustache, and finally the chest. A person's hair becomes grey at a certain age, which is mostly determined by hereditary. However, early pigment loss in adults can be caused by a variety of different circumstances such as disease, certain medicines, fear, or even shock, and it is permanent. However, if hair becomes white in childhood, it might be a result of malfunctioning in the body and medical guidance. A number of side effects, including erythema, irritation of the pores and skin, hair loss or damage, and the majority of malignancies are caused by the continuous use of chemical dye-containing substances on hair. The extended shade resistance in oxidation systems is caused by a strong diffusion of the chemical into the cortex. In addition to giving hair distinctive characteristics, hair dyes also include dye modifiers, antioxidants, alkalizers, soaps, ammonia, wetting agents, fragrance and a variety of other chemical substances used in trace amounts to soften the texture of hair. The proportion of melanin types-eumelanin and pheomelanin determines the colour of your natural hair. Herbal hair dyes are prominent among eco-conscious consumers simply because of their low environmental impact and use of sustainably obtained botanicals rather than toxic chemicals.^[4,5]

TYPES OF HAIR DYE

1. Permanent hair dye
2. Semi-permanent hair dye
3. Demi-permanent hair dye
4. Temporary hair dye

1. Permanent hair dye

These dyes enter the hair shaft and stay there until the hair is removed or grows out.

Ammonia and other alkalizers found in them aid in releasing the hair's cuticle, which permits the colour to enter.

2. Semi- permanent hair dye

These dyes add colour to the hair shaft but do not soak in as well as permanent dyes. After a few washes, they ultimately disappear

3. Demi- permanent hair dye

These colours include semi-permanent and permanent dyes. Though not as much as permanent dyes, they do contain some ammonia and not as long-lasting as permanent dyes, but they outlast semi-permanent dyes.

4. Temporary hair dye: These dyes add colour to the hair shaft but are removed after just one shampoo. They are frequently used for special events or to give hair a splash of colour.

BENEFITS OF HERBAL HAIR DYE GEL



HERBAL MATERIALS USED IN THE FORMULATION

1. HENNA (*Lawsonia inermis*)



Fig1: Henna.

➤ Taxonomy

- Family: Lythraceae
- Genus: Lawsonia
- Species: Lawsonia inermis
- Active Constituents: Lawsone, tannins, flavonoids

• Medicinal Properties

1. Natural hair coloring agent
2. Strengthens hair
3. Prevents dandruff
4. Provides cooling effect to scalp.^[6]

ii. AMLA (*Emblica officinalis*)

Fig 2: Amla.

➤ **Taxonomy**

- Kingdom: Plantae
- Family: Phyllanthaceae
- Active Constituents: Vitamin C, tannins, gallic acid

• **Medicinal Properties**

1. Promotes hair growth
2. Prevents premature greying
3. Strengthens hair roots.^[7]

iii. PALASH (*Butea monosperma*)

Fig 3: Palash.

➤ **Taxonomy**

- Family: Fabaceae
- Active Constituents: Flavonoids, butrin

• **Medicinal Properties**

1. Natural coloring agent
2. Antimicrobial activity
3. Improves scalp health.^[8,9]

IV. HIBISCUS (*Hibiscus rosa-sinensis*)

Fig 4: Hibiscus.

➤ **Taxonomy**

- Family: Malvaceae
- Active Constituents: Flavonoids, mucilage

• **Medicinal Properties**

1. Conditions hair
2. Promotes hair growth
3. Reduce hair fall.^[10,11]

V. REETHA (*Sapindus mukorossi*)

Fig 5: Reetha.

➤ **Taxonomy**

- Family: Sapindaceae
- Active Constituents: Saponins

• **Medicinal Properties**

1. Natural cleanser
2. Removes dandruff
3. Adds shine to hair

CHEMICAL INGREDIENT USED IN THE FORMULATION**I. CARBOPOL 940**

Fig 6: Carbopol 940.

IUPAC name: poly(1-carboxyethylene)

Molecular formula: C₄₂H₈₀O₈

Odour: odourless

Boiling point: 141.2°C (286 °F)

Melting point: 305 °C (581°F)

Use: thickening agent, stabilizer, gelling agent.

ii. METHYL PARABEN**Fig 7: Methyl paraben.**

IUPAC name: methyl 4-hydroxybenzoate

Molecular formula: C₈H₈O₃

Odour: faint odour

Boiling Point: 275-280°C

Melting point: 125–128°C

Use: Preservative, fungicide, they are added to food cosmetics and pharmaceuticals to increase shelf life and avoid bacterial and fungal growth.

iii. GLYCERINE**Fig 8: Glycerine.**

IUPAC name: Propane-1,2,3-triol

Molecular formula: C₃H₈O₃

odour: odourless

Boiling point: 290°C

Melting Point: 17.8 °C

Use: Used as sweetening agent, solvent, pharmaceutical agent, emollient.

iv. TRIETHANOLAMINE**Fig 9: Triethanolamine.**

IUPAC Name: 2,2',2-Nitrilotri(ethan-1-ol)

Molecular Formula: C₆H₁₅NO₃ or (CH₂OHCH₂)₃N

Odour: mild ammonia odour

Boiling point: 335.4°C

Melting point: 21.60°C

Use: used as an excipient in the formulation of topical and oral medications, as well as solubilizing agent.

AIM AND OBJECTIVE

Aim: To Formulate and Evaluate Herbal Hair Dye Gel.

Objective: The objectives of this study are to prepare herbal extracts and mix them into a gel base, to make a smooth and stable gel, and to test it for basic parameters like colour, odour, pH, thickness, spreadability, and stability. The study also aims to check its ability to give natural colour, clean the scalp, and improve hair condition without causing side effects.

MATERIALS AND METHODS**Plant Materials and Chemicals**

Formulation of herbal hair dye gel, the plant materials such as Heena (*Lawsonia inermis*), amla (*Emblica officinalis*), palash (*Butea monosperma*), hibiscus (*Hibiscus rosa-sinensis*), reetha (*Sapindus mukorossi*) were procured from local market of Nagpur (India).

All the plant materials were thoroughly washed with distilled water to remove dirt and impurities and then shade-dried for 4–5 days to preserve their active constituents. The dried materials were further subjected to pulverization using a mechanical grinder and passed through sieve no. 100 to obtain a fine powder suitable for extraction.

Excipients such as Carbopol 940 were used as a gelling agent, glycerin as a humectant and methyl paraben as a preservative. Triethanolamine was used for pH adjustment. All chemicals and reagents used were of analytical grade and procured from standard pharmaceutical suppliers. Distilled water was used throughout the formulation process to maintain purity and consistency.

Extraction of plant materials

The extraction of herbal materials was carried out using Soxhlet extraction method with a hydroalcoholic solvent system consisting of ethanol and water in the ratio of (80:20). Accurately weighed quantities of dried powdered plant materials, namely henna (*Lawsonia inermis*), amla (*Emblica officinalis*), palash (*Butea monosperma*), hibiscus (*Hibiscus rosa-sinensis*), and reetha (*Sapindus mukorossi*), were individually subjected to Soxhlet extraction. Each powdered drug was placed in a thimble and extracted with the hydroalcoholic solvent for sufficient cycles until complete extraction was achieved.

The extracts obtained were then filtered using Whatman filter paper and concentrated using a water bath to

remove excess solvent, resulting in semi-solid extracts.

All the prepared extracts were stored in airtight containers under refrigerated conditions for further use.

PHYTOCHEMICAL SCREENING OF HERBAL EXTRACT

The above prepared herbal extract was subjected to phytochemical screening to reveal the various

phytoconstituents as carbohydrates, tannin, glycosides, flavonoids and saponins. The extract was individually dissolved in 5 ml of water and filtered; the filtrates were used to perform the chemical test -and the result was shown in Table 1.

Table 1: Phytochemical evaluation of herbal extract.

Sr. No.	Phytoconstituents	Henna	Hibiscus	Reetha	Amla	Palash
1	Tannins	+	+	+	+	+
2	Glycosides	+	+	+	+	+
3	Flavonoids	+	+	-	+	+
4	Carbohydrates	+	+	+	+	+
5	Saponins	-	+	+	-	+

+ = Present - = Absent

Method of Preparation for gel base

1. Weigh required quantity of Carbopol 940 and dispersed in required quantity of distilled water in beaker.
2. Keep beaker aside for half an hour to swell Carbopol 940 and then start stirring at 1200 rpm by using mechanical stirrer for 30 min.
3. Ensure complete hydration and swelling of Carbopol.
4. Add preservatives, humectants (e.g., glycerin), and other required ingredients with continuous stirring.
5. Adjust the volume with distilled water and ensure uniform consistency.

Incorporation of Extracts

Pre-Incorporation Checks

Before adding extract Ensure gel base is lump-free and homogeneous Check pH compatibility of extracts Ensure extracts are cool (room temperature). Hot extracts can break gel structure.

Method of Incorporation

Add herbal extracts slowly in small portions into the gel base. Use continuous gentle stirring (avoid vigorous mixing). Prefer geometric dilution method: Mix small quantity of extract with gel first then gradually add remaining extract. This ensures uniform distribution.^[13]

METHOD OF PREPARATION OF GEL CONTAINING EXTRACTS^[14]

To prepare the gel base, required quantities of chemical ingredients are weighed such as Carbopol 940, methyl paraben, glycerine and triethanolamine. Take 1g of Carbopol 940 and dissolve it in required quantity of water of in a clean beaker and kept 30 min for hydration. After the hydration of Carbopol 940 continuous constant stirring by using a mechanical stirrer and add the remaining chemical ingredients such as methyl paraben and glycerine. Later add the herbal extracts and add sufficient amount of water qs to produce 100 mL and mix it until uniform distribution is obtained, then add triethanolamine to adjust the pH and add sufficient drops of perfume for fragrance. The details of formulation are shown in table 2.

Table 2: Formulation of herbal hair dye gel batches by trial-and-error method.

Sr. No.	Ingredients	F1	F2	F3
1	Carbopol 940	1g	1g	1g
2	Henna extract	4g	6g	8g
3	Amla extract	2g	3g	4g
4	Hibiscus extract	1g	2.5g	3g
5	Palash extract	1.5g	2.5g	3g
6	Reetha extract	1.5g	1.5g	2g
7	Glycerine	5g	5g	5g
8	Methyl Paraben	0.5g	0.5g	0.5g
9	Triethanolamine	2 drops	2 drops	2 drops
10	Distilled Water	q.s. to 100ml	q.s. to 100ml	q.s. to 100ml

Table 3: Optimize formulation of herbal hair dye gel.

Sr. No.	Ingredients	F2
1	Carbopol 940	1g

2	Henna extract	6g
3	Amla extract	3g
4	Hibiscus extract	2.5g
5	Palash extract	2.5g
6	Reetha extract	1.5g
7	Glycerine	5g
8	Methyl Paraben	0.5g
9	Triethanolamine	2 drops
10	Distilled Water	q.s. to 100ml

Evaluation

1. Organoleptic Evaluation

The prepared herbal hair dye gel was evaluated for its colour, odour, texture, consistency and appearance by visual inspection.^[13]



Fig. 10: Formulation of hair dye gel.

2. Physical assessment

a. Determination of pH

The pH of different formulations was determined using a digital pH meter. 1 g of gel was dispersed in 10 ml distilled water and the pH was recorded.



Fig 11: pH meter.

b. Determination of Viscosity

The viscosity of the prepared gel was measured using a Brookfield viscometer at suitable rpm (e.g., 10 rpm), and the corresponding dial reading was noted.

c. Spreadability

Spreadability was determined by placing a known quantity of gel between two glass slides and applying a

fixed weight (50 g). The time required for the slides to separate was noted.

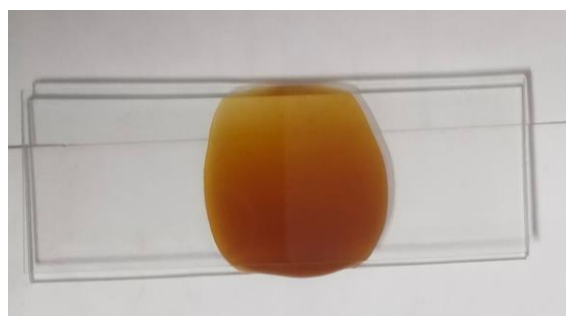


Fig. 12: Spreadability.

d. Homogeneity

The formulated gel was tested for homogeneity by visual inspection after placing it in a suitable container. The gel was examined for appearance and presence of any aggregates or lumps.

e. Dyeing Effect

The dyeing effect of the gel was evaluated by applying 1 g of gel on hair strands. After 60 minutes, the hair was washed with water and observed for color intensity and shade.



Fig. 13: Dyeing effect.

f. Washability

The washability of the gel was evaluated by applying it on hair and rinsing with water. The ease of removal was observed.

g. Stability Study

The hair dye gel was stable for the time period of two months at room temperature. The formulation was evaluated for the physical parameters like colour, odour, pH, texture and consistency.



Fig. 14: Stability Study.

RESULTS AND DISCUSSION

The formulated herbal hair dye gel was examined for various parameters such as organoleptic, physiochemical and phytochemical evaluation.

Three formulations (F1, F2, F3) had an acceptable consistency, appearance, odour and colour. The pH of three formulations was found to be closer to the neutral pH 6.0. F2 is considered to be best because it shows neutral pH. Viscosity of F was found to be higher than the other formulations. The results of the spreadability test and homogeneity indicates that all 3 gel formulations had good spreadability properties and homogeneity.

From the results, formulation F2 has excellent dyeing effects. The Dye study on human hair shows a brown hair colour after 1 hr as compared to other formulations. There was no change in colour, odour and consistency observed during stability studies.

Table 4: Physical Evaluation Table.

Sr.no	Parameters	F1	F2	F3
1	pH	5.8	6.0	6.9
2	Spredability	High	Moderate	Low
3	Washability	Easy	Moderate	Difficult
4	Dyeing effect	Light	Moderate	Excellent (Dark)
5	Homogeneity	Good	Good	Good
6	Viscosity	240cP	290cP	250cP

Table 5: Organoleptic Evaluation Table.

Sr. No.	Parameters	F1	F2	F3
1	Color	Light brown	Brown	Dark brown
2	Appearance	Smooth gel	Smooth & uniform gel	Thick gel
3	Odour	Mild Herbal	Pleasant & Herbal	Strong Herbal
4	Consistency	Semi-solid	Semi-solid	Highly viscous

Table 6: Stability study table.

Parameters	Batch	Initial	7days at room temperature	7 days at refrigerated condition
Color	F1	Light brown	No change	No change
	F2	Brown	No change	No change
	F3	Dark brown	No change	No change
Odor	F1	Mild Herbal	No change	No change
	F2	Pleasant & Herbal	No change	No change
	F3	Strong Herbal	Slight change	No change
pH	F1	5.8	5.6	5.9
	F2	6.0	5.9	6.1
	F3	6.7	6.8	7.0
Consistency	F1	Semi-solid	No change	No change
	F2	Semi-solid	No change	No change
	F3	Highly viscous	Slightly increase viscosity	No change

SUMMARY AND CONCLUSION

Summary: The present study focused on the formulation and evaluation of an herbal hair dye gel using suitable natural ingredients such as henna, amla, hibiscus, and reetha. The prepared gel was evaluated for organoleptic properties such as color, odour, appearance, texture, consistency, homogeneity, spreadability, washability, and stability. The formulation showed satisfactory results with good physical appearance and acceptable organoleptic properties. The gel was smooth, homogeneous, and free from any lumps or phase separation, indicating proper formulation. Overall, the herbal hair dye gel was found to be safe, effective, and suitable for topical application, providing natural colouring along with conditioning benefits to the hair.

Conclusion: From the present study, it can be concluded that the herbal hair dye gel was successfully prepared and evaluated. The results showed that the formulation possessed acceptable organoleptic and physical properties. The developed gel has good potential for use as a natural hair colouring agent, providing effective colouring along with conditioning benefits.

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PHYTOCHEMICAL BASED SOAP: FORMULATION AND EVALUATION STUDY

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ABSTRACT

The growing demand for herbal and chemical-free cosmetic products has encouraged the development of phytochemical-based formulations with enhanced therapeutic benefits. The present study focuses on the formulation and evaluation of a herbal soap using *Moringa oleifera* and lemongrass essential oil as key active ingredients. *Moringa oleifera* is rich in phytoconstituents such as flavonoids, tannins, saponins, and phenolic compounds, which exhibit antioxidant, antimicrobial, and skin-protective properties. Lemongrass oil is well known for its antibacterial, antifungal, and refreshing fragrance. The soap was formulated using a glycerin base, followed by the incorporation of moringa extract and lemongrass oil in optimized concentrations. The prepared formulation was evaluated for various physicochemical parameters including

pH, moisture content, foam height, foam retention, hardness, and stability. The results demonstrated that the formulated soap had a skin-compatible pH, good foaming ability, and satisfactory physical stability. The presence of phytochemicals contributed to enhanced antimicrobial activity against common skin pathogens. The formulation also exhibited good cleansing efficiency and was found to be non-irritating to the skin. In conclusion, the phytochemical-based herbal soap formulated with moringa and lemongrass oil can be considered a safe, effective, and eco-friendly alternative to conventional soaps, offering both cosmetic and therapeutic benefits.

KEYWORDS: *Moringa oleifera*, Lemongrass oil, Herbal soap, Phytochemicals,

Antimicrobial activity, Antioxidant, Glycerin soap base, Skin care, Formulation, Evaluation.

INTRODUCTION

Soap is a cleaner for dirt, dust and bacteria (germs) that stick to the surface of the skin. Soap is a product that is used as a cleaner mixed with water, in general soap is in solid or liquid form.^[1] Herbal soaps are cosmetic cleansing agents prepared using plant-based oils, extracts, and bioactive compounds without the addition of synthetic surfactants or harsh chemicals.^[2]

Herbal soaps that include herbal extracts should have considerable antibacterial, antimicrobial, anti-aging, anti-oxidant, and antiseptic action, promote skin conditioning, have a great foam, have a pleasant aroma, and be soft on the skin. In this study moringa (*Moringa oleifera*) and lemongrass (*Cymbopogon citratus*) are used as key herbal ingredients.

Moringa is rich in vitamins, minerals and antioxidants, moringa help in cleansing and nourish the skin, promoting a healthy complexion.^[3] Other benefits of moringa leaves include: giving a feeling of wellness and promotes energy, increases natural body defense, stimulates metabolism, stimulates the cell structure of the body; Rich in vitamin A, provides nourishment to the eyes and brain, balances level of cholesterol, balances level of sugar, rich in antioxidants, beautifies the skin and lowers the appearance of fine lines and wrinkles, improves functioning of kidney and liver, promotes healthy digestion; promotes body's immune system; promotes anti-inflammatory features, heals arthritis pain, heals tumors and ulcers; balances hormone and gland system, detoxify body from poisons, helps relax and promotes good night sleep, and purifies water^[4]. Lemongrass contains essential oils and phenolic compounds that provide antibacterial, antifungal, and refreshing properties.^[5]

Currently available products

- D'Acne soap
- Mannlich Anti Acne soap
- Acnezee soap
- Dermadew Acne soap
- Alite Deep cleansing soap

Limitations of synthetic soap

- Removal of natural oils
- Skin barrier dysfunction

- Irritant contact dermatitis
- pH imbalance
- Allergic reaction.^[6]

Moringa



Fig.1 Moringa leaves.

Synonym: Drumstick

Biological name: *Moringa oleifera*

Biological source: It can consist of dried, long, slender seed-pods of *Moringa oleifera*

Family: Moringaceae.

Chemical constituent - Nitrates, Quercetin, Glucosides.

Geographical source: Moringa is a plant that is native to the sub-Himalayan areas of India, Pakistan, Bangladesh, and Afghanistan. It is also grown in the tropics. *Moringa oleifera*, or moringa, is a popular choice for herbal soap due to its numerous skincare benefits. Rich in vitamins, minerals, and antioxidants, moringa helps cleanse and nourish the skin, promoting a healthy complexion. Its anti-inflammatory properties can also soothe skin irritations, making it an excellent ingredient for sensitive skin. Additionally, moringa's natural cleansing properties make it effective in removing impurities and dirt from the skin, leaving it feeling refreshed and rejuvenated.

Uses: Moisturizer, Conditioner, hair growth promoter, cleanser, anti-wrinkle, anti-aging, anti-acne, scar removal, pigmentation, and control for skin infection, sores, as well as sweating, it has also been utilized in cosmeceuticals.^[7]

Lemongrass



Fig. 2 Lemongrass.

Common name: Lemongrass

Biological Source: the volatile oil distilled from *Cymbopogon flexuosus* Stapt and *C. citrates* Stapt.

Family: Graminae

Geographical source: *C. Flexusus* is indigenous to India and is found in Tinnevely, Travancore and Cochin. *C. citratus* is cultivated in Java, Ceylon, Burma, Madagascar, Mauritius, S. America and W. Indies. In India, it is grown in Punjab, Bombay, Baroda and Mysore.

Chemical Constituents: It contains mainly citral, traces of linalool, citronelal, geraniol, limonene caryophyllene, linalyl and geranyl acetate etc.

Uses: Oil is used in perfumery, soaps, and cosmetics and as a mosquito repellent.

It is used for isolation of citral, which is used for manufacturing ionones. The β -ionone is used for synthesis of Vitamin A.^[8]

MATERIALS AND METHODS

Ingredients: Moringa oleifera leaves extract, lemongrass oil.

Chemicals: Stearic acid, Sodium hydroxide, Castor oil, Coconut oil, Ethanol, Glycerine, Sugar, Distilled water.^[9]

METHODS

Moringa leaves extract

➤ Fresh Moringa oleifera leaves were collected and cleaned to remove dust and

impurities.

- The leaves were shade dried and then coarsely powdered.
- Moringa leaves extraction is made using the maceration method.
- Moringa leaves powder weighted 60 gm. Were soaked using 300ml of 70% ethanol solvent for 72 hours.
- Stirring occasionally at the same time.
- Then carried out a filtering process then filtered using filter paper and evaporated using water bath.
- Then obtained a thick extract.^[10]



Fig.3 Extraction of Moringa.

Formulation process

Table no. 1: Batches of soap based formulations.

Sr. No.	Ingredients	B1	B2	B3	B4
1.	Coconut oil	25	18.5ml	16.3ml	16.3ml
2.	Stearic acid	-	5gm	7.5gm	7.5gm
3.	Castor oil	-	14ml	5.2ml	5.2ml
4.	NaOH	5gm	3.5ml	3.5gm	3.5gm
5.	Distilled water	50ml	7.5ml	7.5ml	7.5ml
6.	Ethanol	-	3ml	5ml	10ml
7.	Glycerine	2.5ml	7.95ml	5.9ml	5.9ml
8.	Sugar	-	5gm	2.5gm	2.5gm

Note: Batch 3 was optimized formulation, hence it was selected for formulation.

Table no. 2: Batches of Moringa extract concentration formulations.

Sr. No.	Ingredients	B1	B2	B3
1.	Moringa extract	0.4gm	0.2gm	0.3gm
2.	Lemongrass oil	2 drops	2 drops	2 drops
3.	Soap base	50 gm	50 gm	50 gm

Note: Batch 2 was optimized formulation, hence it was selected for formulation.

Procedure of soap base

- First of all, take coconut oil, castor oil in a 100 ml beaker.
- Put the beaker in a water bath and stir boil it until a strong consistency form at a temperature between 40°C to 45°C.
- Then take a NaOH dissolve in distilled water in another beaker and mixed properly.
- After preparing, this solution was added slowly in oil mixture with constant stirring.
- Add glycerine, ethanol.
- Then this mixture was boil at 40°C to 45°C until base consistency and pour the mixture into soap moulds.
- Allow to set.

Procedure

- Take 50 gm of soap base in a beaker and put on water bath at 45°C.
- Then add the moringa leaves extract and lemongrass oil with continuous stirring in to soap base.
- Boil the mixture on the water bath 45°C and soap mixture is prepared.
- Prepared soap mixture is filled in soap mould.
- Mould is put in the refrigerator for 15 minutes.
- After solidification cut the soap mould using cutter or blade.
- Then obtained herbal soap.^[11]

Evaluation Parameters

- **Colour:** When visualizing the herbal soap, a white background was used so that the colour could be determined and so that the clarity of formulations is seen.
- **Odour/Aroma:** An evaluation of the odour of formulations we used two different methods. The first method included heating the sample on a hot plate.
- **Shape:** Evaluation of organoleptic properties, such as shape and clarity, was carried out by sensory examination.^[12]
- **pH:** 5 to 6 g of the soap was weighted accurately in a 100ml beaker 40ml water was added and dispersed the soap in it. The pH of the solution is determined by using pH meter.^[13]



Fig. 4 pH Meter.

Determination of TFM (Total Fatty Matter): By reacting soap with acid in the presence of hot water and measuring the resulting fatty acid, TFM was determined. After dissolving 10g of the designed soap in 150ml of distilled water, the mixture was heated. 20 ml of 15% H₂SO₄ were added to this and heated until a clear solution was achieved. The resulting solution's surface fatty acid was solidified by heating it once again and adding 7g of beeswax. It was then permitted to cake. After removing the cake, it was blotted dry and weighed using formula.

$$\% \text{TFM} = \frac{\text{weight of a cake} - \text{weight of the wax in gm}}{\text{weight of the soap in gm}} \times 100^{[14]}$$



Fig. 5 Total Fatty Matter.

- **Moisture content:** About 10 gram of the material were heated in a hot air oven at 100 to 105 degrees Celsius for an hour. After that deducted the true weight of the tarred china dish from the total weight of the sample and dish. The weight of the material was recorded, and the method for calculating the percentage of the moisture content that can be found in it is shown below formula.

Moisture Content = Initial wt. - Final wt. / Initial wt. × 100.



Fig. 6: Moisture content.

Foam Forming Ability: The Cylinder Shake Method was utilized to determine the Foaming ability. First, in a 100 ml measuring cylinder, we put 50 ml of a 1% sample solution and shaken vigorously 10 times. After shaking for 1 minute, we measured the height of the foam that had formed and recorded the total volume of foam.



Fig.7 Foam Forming Ability.

➤ **Foam Stability:** The Cylinder Shake Method was utilized to determine the Foaming ability. First, in a 100ml measuring cylinder, we put 50 ml of a 1% sample solution. The cylindrical container was covered up with the use of the hand and shaken vigorously 10 times. The volume of the foam after ten minutes was calculated.



Fig. 8 Foam Stability.

- **Skin Irritation test:** For the determination of irritancy test, Use the soap sample on clean skin to observe. For signs of irritation, such as redness, burning, or itching and 24 hours, the situation was monitored.^[15]



Fig.9 Skin Irritation Test.

RESULT AND DISCUSSION

Evaluation Test Result

Parameters	Observational Value	Standard Value
pH	8.20	7-10
Total Fatty Matter	60%	50-70%
Moisture content	24.45%	15-25%
Foam forming ability	9cm	10cm
Foam stability	5cm	5cm
Skin irritation test	No	No

CONCLUSION

The present investigation focused on the formulation and evaluation of a phytochemical-based herbal soap incorporating moringa extract and lemongrass essential oil. The study demonstrated that the integration of plant-derived bioactive constituents into a soap base can significantly enhance its functional and therapeutic properties. The formulated herbal soap exhibited satisfactory physicochemical parameters, including suitable pH, good foaming capacity, optimal hardness, and stability. The presence of moringa extract contributed notable antioxidant and skin-conditioning effects, while lemongrass oil imparted antimicrobial activity along with a characteristic refreshing fragrance. The evaluation results confirmed that the formulation is safe, effective, and non-irritant for topical application. The findings support the potential of phytochemical-based herbal soaps as a promising alternative to conventional synthetic formulations, aligning with the growing demand for natural, eco-friendly, and skin-compatible products. However, further studies involving long-term stability assessment, microbial challenge tests, and clinical evaluation are recommended to validate its efficacy and scalability for commercial application.

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FORMULATION AND EVALUATION OF SYNDET BASED BABY SOAP

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ABSTRACT

Baby skin is delicate and more prone to dryness, irritation, and microbial infections due to its thinner stratum corneum, higher pH, and lower lipid content compared to adult skin. Conventional soaps may disrupt the natural skin barrier because of their alkaline nature. Therefore, the present study focuses on the formulation and evaluation of a mild, skin-friendly syndet-based baby soap incorporating natural and herbal ingredients such as calendula oil, neem oil, lavender oil, aloe vera gel, and vitamin E. The soap base was prepared using a saponification process followed by a melt-and-pour method to ensure uniform incorporation of active ingredients. Key components such as coconut oil, castor oil, stearic acid, glycerin, ethanol, and sugar were used to enhance lather, hardness, transparency, and skin hydration. The prepared formulations were evaluated for organoleptic and physicochemical parameters including color, odor, texture, pH, foamability, foam retention, hardness, and skin irritation. The results indicated that the developed syndet-based baby soap exhibited good physical characteristics, stable foam properties, and no signs of skin irritation, confirming its suitability and safety for baby skin.

KEYWORD: Baby soap, Syndet, Baby skincare, Herbal formulation, Mild cleanser.

INTRODUCTION

Skin care is an essential aspect of personal hygiene and overall well-being. The use of cleansing agents, such as soap and syndet bars, plays a vital role in maintaining healthy skin.^[1]

Baby skin is structurally and functionally different from adult skin. It has a thinner stratum corneum, lower lipid content, and a higher pH, which makes it more vulnerable to irritation and dryness. Therefore, special cleansing products are required to maintain skin hygiene without disturbing the natural moisture barrier. One of the most important things you can do to keep your baby healthy is to clean their skin with baby soap. Baby soaps are formulated to be mild and skin-friendly; however, they may still contain preservatives and other additives depending on formulation.^[2]

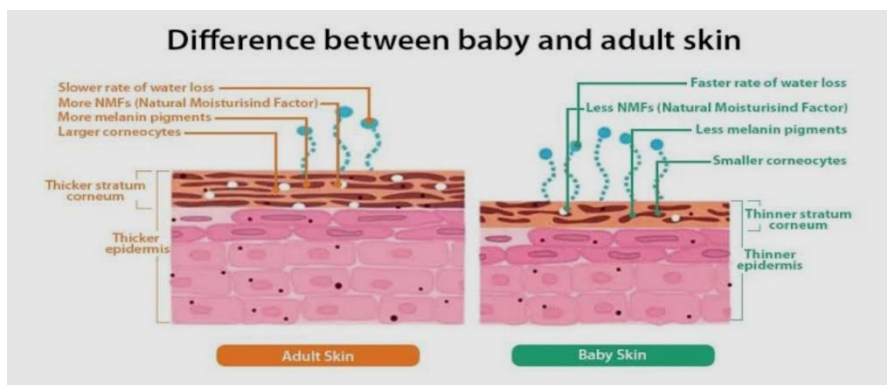


Fig. 1: Different between baby and adult skin.

Common skin problems in babies include

Dry and Rough Skin – Common in babies due to loss of moisture, frequent bathing, and use of harsh alkaline soaps.

Skin Irritation – Caused by synthetic chemicals, fragrances, or high pH products leading to redness and discomfort.

Rashes and Redness – Includes diaper rash and contact dermatitis due to allergens, microbes, or irritants.

Cracked or Peeling Skin – Occurs due to excessive dryness or environmental factors such as cold weather.

Microbial Infections – Bacterial or fungal infections may develop due to improper hygiene or compromised skin barrier.

To prevent these skin problems, various skincare products are available in the market, such as:

- Baby soaps
- Syndet bars
- Baby lotions
- Moisturizing creams
- Baby oils

Each of these products serves a specific purpose—cleansing, moisturizing, nourishing, and protecting the skin.

Traditional baby soaps, though widely used for cleansing, may sometimes have a more alkaline nature that can disturb the skin's natural pH. On the other hand, syndet bars are known for their mild and skin-friendly properties.^[3] Similarly, baby lotions and moisturizing creams help in maintaining hydration, while baby oils provide nourishment and prevent moisture loss. The growing awareness toward gentle and safe skincare has led to the development of formulations that combine cleansing with moisturizing benefits.

Syndet based baby soap is an innovative category of cosmetic formulations that aim to formulate a mild and effective baby soap by incorporating the advantages of different baby care products.^[3] The formulation includes natural oils and herbal ingredients such as neem, calendula, lavender, and aloe vera, which are known for their soothing, antimicrobial, and moisturizing properties.^[16] The aim is to develop a soap which mimic the action of syndet and not only cleanses effectively but also helps in retaining skin moisture and protecting delicate baby skin.

The prepared formulation is evaluated for important parameters such as pH, foamability, hardness, and overall skin compatibility to ensure its safety and effectiveness for baby use. This study focuses on developing a gentle, multifunctional baby cleansing bar that supports healthy skin care.

By carefully selecting suitable oils and controlling the formulation conditions, a mild and skin-friendly soap base can be developed. In addition to the soap base, natural ingredients such as neem oil, calendula oil, aloe vera, lavender oil, and vitamin E are incorporated to

enhance the therapeutic effectiveness of the product. The combination of these ingredients helps in improving skin hydration, protection, and overall skin health of infants.^[4]



Fig. 2: Baby Soap.

Aim: To formulate and evaluate a mild, skin-friendly syndet-based baby soap.

Objective: The objective of this study is to formulate a mild and skin-friendly syndet-based baby soap using natural ingredients such as neem, calendula, lavender, aloe vera, and vitamin E. Additionally, the prepared product is evaluated for parameters like pH, foamability, hardness, and skin compatibility to ensure its safety, effectiveness, and suitability for delicate baby skin.

MATERIALS AND METHODS

List of chemicals & reagents, Apparatus & Instrument

Sr. No	Ingredients	Instrument	Apparatus
1.	Calendula oil	Weighing balance	Beaker
2.	Neem oil	pH meter	Glass rod
3.	Lavender oil	Hot air oven	Tripod stand
4.	Aloevera gel		Burner
5.	Rose oil		
6.	Coconut oil		Measuring cylinder
7.	Stearic acid		Wire gauze
8.	Castor oil		China dish
9.	NaOH		Mould
10.	Glycerin		
11.	Ethanol		
12.	Sugar		
13.	Distilled Water		

Ingredients

Calendula

Calendula oil is obtained from the flowers of *Calendula officinalis*. It is widely known for its anti-inflammatory, soothing, and healing properties. It is commonly used in skincare products, especially for sensitive and baby skin.

Common Name: Pot Marigold

Botanical Name: *Calendula officinalis*

Family: Asteraceae

Origin: Mediterranean region

Plant Type: Herbaceous flowering plant

Chemical Constituents: Flavonoids, Triterpenoids, Carotenoids, Saponins^[5]



Fig. 3: Calendula flower

Neem

Neem oil is extracted from the leaves of *Azadirachta indica*. It possesses strong antibacterial, antifungal, and anti-inflammatory properties and is widely used in medicinal and cosmetic preparations.

Common Name: Neem

Botanical Name: *Azadirachta indica*

Family: Meliaceae

Origin: Indian subcontinent

Chemical Constituents: azadirachtin, nimbin, nimbidin, nimbolide, and salannin^[6]



Fig. 4: Neem.

Extraction (Neem Leaf Infused Oil)

Wash the neem leaves and let them dry completely (no moisture).



Crush or grind the leaves slightly.



Heat the carrier oil on low flame



Add the leaves and simmer on very low heat for 20–30 minutes.



Let it cool, then strain using a cloth or sieve.



Store in a clean glass bottle.^[7,8,9]

Lavender

Lavender oil is an essential oil extracted from the flowers of *Lavandula angustifolia*. It has a pleasant fragrance and is known for its calming, antiseptic, and soothing properties.

Common Name: Lavender

Botanical Name: *Lavandula angustifolia*

Family: Lamiaceae

Plant Type: Aromatic shrub

Chemical Constituents: Linalool, Linalyl acetate, Terpenes, Flavonoids, Tannins.^[10]



Fig. 5: Lavender.

Aloe vera

Aloe vera is a succulent plant species that has been used for centuries for its medicinal, cosmetic, and culinary purposes. The gel extracted from the leaves of the aloe vera plant is rich in vitamins, minerals, and antioxidants.

Common Name: Aloe vera

Botanical Name: Aloe barbadensis Miller

Family: Asphodelaceae

Chemical Constituents: Flavonoids, Triterpenoids, Carotenoids, Saponins, Aloin



Fig. 6: Aloe Vera Plant.

1. Soothes skin irritations: Aloe vera gel has anti-inflammatory and soothing properties.
2. Hydrates the skin: Aloe vera gel is rich in vitamins A, C, and E which help to hydrate and nourish the skin.^[11]

Vitamin E

Vitamin E is a natural antioxidant commonly added to baby soap to protect delicate skin and improve product stability. It helps moisturize and soothe the skin, reducing dryness and irritation. Additionally, it prevents oxidation of oils in the soap, thereby enhancing shelf life and maintaining quality.^[12]



Fig. 7: Vitamin E Capsule.

Coconut oil (*Cocos nucifera*),

Derived from the meat of mature coconuts, has Emerged as a versatile and highly valued natural product with a wide array of applications. Renowned for its distinct aroma, creamy texture, and myriad health benefits, coconut oil has been Utilized for centuries across various cultures for culinary, medicinal, and cosmetic purposes.



Fig. 8: Coconut Oil.

Function:

Acts as a cleansing agent by removing dirt and oils
Produces good foam and lather
Gives hardness to the soap
Provides mild antimicrobial effect

Stearic Acid

Stearic acid is a saturated fatty acid commonly used in soap and cosmetic formulations. It acts as a hardening agent and helps in improving the texture and stability of soap.

Chemical name: Octadecanoic acid

Molecular formula: $C_{18}H_{36}O_2$



Fig. 9: Stearic Acid.

Castor Oil (Ricinus Communis)

Castor oil (*Ricinus Communis*) is a vegetable oil obtained from the seeds of the Castor bean plant. It is rich in ricinoleic acid, which gives it its emollient properties. It is Especially valued in herbal and natural cosmetic products for being plant-based, skin-friendly, And effective at dispersing pigments.



Fig. 10: Castor Oil.

Role

Acts as a moisturizer (emollient) – keeps baby skin soft and prevents dryness
Provides rich, creamy lather even in hard water
Works as a humectant – attracts moisture to the skin
Helps improve transparency and smooth texture

Sodium Hydroxide

Sodium hydroxide is a strong alkali used in the saponification process for soap preparation. It reacts with oils and fats to form soap and glycerin.

Chemical name: Sodium hydroxide

Molecular formula: NaOH



Fig. 11: Sodium Hydroxide.

Glycerine

Glycerine, also known as glycerin or glycerol, is a natural compound derived from vegetable oils and fats. Glycerine is a polyol compound with the chemical formula $C_3H_8O_3$. It consists of a three-carbon chain with three hydroxyl groups (-OH) attached.

Chemical formula $C_3H_8O_3$

Water

Water is used as a solvent in the soap-making process. It dissolves sodium hydroxide and facilitates the saponification reaction.

Chemical formula: H_2O

Ethanol

Ethanol is used as a solvent and helps in improving the transparency of glycerin soap base.

Chemical name: Ethyl alcohol

Molecular formula: C_2H_6O

Sucrose

Sucrose is added to enhance the transparency and improve the texture of the soap.

Chemical name: Sucrose

Molecular formula: $C_{12}H_{22}O_{11}$



Fig. 12: Sucrose.

Process**Step 1 (Soap base preparation)**

Preparation of lye solution: Take distilled water in heat resistant containers. Slowly add NaOH into water Stir until fully dissolved. Allow to cool to 35 to 40°C.



Oil phase Preparation : Weight Coconut oil ,stearic acid and Castor oil. Heat gently at 60-70°C until Completely melted.



Saponification : Slowly pour cooled lye solution into melted oils. Continue mixing until trace stage (thick consistency)



Heat mixture on double boiler Stir continuously Mixture becomes gel like & semi-transparent complete saponification (no oil separation).



Add glycerine & mix. Add dissolved sugar solution Slowly add ethanol Continue gentle heating until soap becomes clear



Remove from heat Pour into small silicone mould Spray alcohol to remove bubbles. Allow to set for 12-24 hours.

Step 2 (Melt and Pour Method)

1. Melt the Soap Base: Cut the soap base into small pieces. Heat it in a double boiler or microwave until it melts. Stir it.



2. Add Scents and Herbs: Take the melted soap off the heat. Add essential oils and herb (Calendula oil, Neem oil, lavender oil, Aloe vera gel, vit e.). Mix well.



3. Pour into Moulds: Pour the liquid soap into molds. Tap the molds gently to remove air bubbles.



4. Let It Cool: Leave the soap to cool and harden for a few hours. Once it is solid, take it out of the moulds.^[3,13]

Formula

For soap base:

Sr. No	Ingredients	F1	F2	F3	F4	F5	Role
1.	Coconut oil	16 ml	16 ml	16.3ml	16.3ml	15ml	Cleansing, good lather
2.	Stearic acid	12 g	7.5 g	7.5 g	7.5g	8g	Hardness, structure
3.	Castor oil	4.1ml	5.2ml	5.2ml	5.5ml	5ml	Creamy foam mildness
4.	NaOH	4 g	3.5 g	3.5 g	3.5 g	3.5g	Saponification
5.	Glycerin	5.9ml	5 ml	5.9ml	6ml	6ml	Transparency, humectant
6.	Sugar	0.5 g	0.5g	0.5g	0.5g	0.2g	Transparency enhancer
7.	Ethanol	5ml	6.3ml	5ml	6.3ml	6ml	Clear appearance
8.	Distilled Water	qs	qs	qs	qs	qs	-
9.	Rose oil	qs	qs	qs	qs	qs	Fragrance

For soap:

Sr. No	Ingredients	F1	F2	F3	F4	F5	Role
1.	Calendula oil	1.5ml	1 ml	1.5ml	1.5ml	1.5ml	Anti- inflammatory
2.	Neem oil	0.5ml	0.2ml	0.5ml	0.5ml	0.5ml	Anti – bacterial
3.	Lavender oil	0.1ml	0.1ml	0.1ml	0.1ml	0.1ml	Calming, fragrance
4.	Aloe Vera gel	2.5g	2.5g	2.5g	2.5g	2.5g	Moisturizing
5.	Vit. E	0.1ml	0.2ml	0.2ml	0.2ml	0.2ml	Antioxidant, protective

Physical parameter**Organoleptic Evaluation Parameters**

Colour and shape: Evaluated by visual observation.

Appearance: Refers to the overall look of the soap. It should be free from cracks, rough surfaces, air bubbles, or uneven texture.



Fig. 13: Formulated Baby Soap.

Odour/Fragrance: Assessed by smelling the soap. It should possess a pleasant and characteristic herbal aroma derived from plant extracts or essential oils. No rancid or strong chemical odour should be present.

Texture/Feel: Determined by touching the soap. The soap should feel smooth and firm, neither too soft nor excessively brittle.

Consistency/Hardness: Checked by gently pressing with fingers. The soap should be firm enough to maintain its shape but not so hard that it becomes brittle.^[14, 15]

Physico-Chemical Evaluation

Determination of pH

2g of prepared soap was dissolved in distilled water and stirred until completely dissolve. The pH was detected using pH meter^[2]



Fig. 14: pH.

Foam Height

2g of soap was dissolved in 50ml of distilled water and shake vigorously Dissolved sample was allowed to stand for 10min the height of the foam was measured.^[2]



Fig. 15: Foam Height.

Foam Retention

25ml of 1% soap solution was taken into a 100ml graduated measuring cylinder The cylinder was covered with band and shake 10 times. The volume of foam at 1min interval for 4min Was recorded.^[2]

Skin Irritation

No significant skin irritation or adverse reaction were observed during patch testing on adult skin.



Fig. 16: Skin Irritation Test.

Determination of TFM [Total Fatty Matter]

In this procedure approximately 10 g of the soap sample was taken and dissolved in 150ml of water Distilled]



It was dissolved by heating.



Then this soap solution was treated with 20% sulphuric acid and heated till the solution get cleared



Fatty acids would be observed at the surface or the film which were then solidified by the addition of 7g of Bees wax and again heated



Cake formation takes place and it was remove and weighed

$$\text{TFM (\%)} = (\text{Weight of fatty matter} / \text{Weight of sample}) \times 100.^{[2]}$$

Moisture content

About 10 gram of the material were heated in a hot air oven at 100 to 105 degrees Celsius for an hour.



After that deducted the true weight of the tarred china dish from the total weight of the sample and dish.



The weight of the material was recorded, and calculating the percentage of the moisture content

$$\text{Moisture (\%)} = (\text{Loss in weight} / \text{Initial weight}) \times 100.^{[15]}$$

**Fig. 17****Fig.18****Result:**

Sr. No	Parameters	F1	F2	F3	F4	F5
1.	Colour	Pale yellowish	Pale yellowish	Pale yellowish	Transparent amber	Pale yellowish
2.	Odour	Slightly Rose essence	Slightly Rose essence	Slightly Rose essence	Slightly Rose essence	Slightly Rose essence
3.	Shape	Rectangular	Rectangular	Rectangular	Rectangular	Rectangular
4.	Appearance	Good	Good	Good	Good	Good
5.	Texture	Smooth	Smooth	Smooth	Smooth	Smooth
6.	pH	7	6.9	6.8	6.2	7.3
7.	Foam Height	10cm	20cm	16cm	22cm	10cm
8.	Foam Retention	5min	4min	10min	12min	5min
9.	Skin irritation	No irritation	No irritation	No irritation	No irritation	No irritation
10.	Hardness/ Consistency	Good	Good	Good	Good	Good

RESULTS

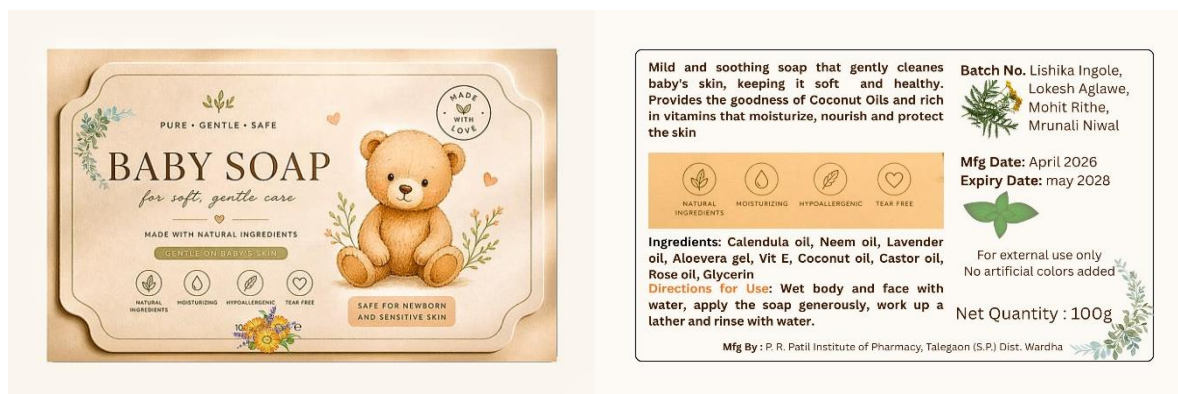


Fig. 18

SUMMARY AND CONCLUSION

The present study successfully achieved its aim of formulating and evaluating a mild, skin-friendly syndet-based baby soap using a combination of natural oils and herbal ingredients such as calendula, neem, lavender, aloe vera, and vitamin E. The formulation process involved systematic preparation of a soap base through saponification followed by incorporation of active ingredients using the melt-and-pour method, ensuring uniformity and stability. The developed formulations (F1–F5) were evaluated through organoleptic and physicochemical parameters, where all batches showed good appearance, smooth texture, acceptable hardness, and pleasant fragrance. The pH values (6.2–7.3) were found to be suitable for baby skin, while foamability and foam retention indicated satisfactory cleansing performance. Importantly, no signs of skin irritation were observed during patch testing, confirming the safety and mildness of the formulation. Among the formulations, F4 showed comparatively better performance with a pH of 6.2, highest foam height (22 cm), and maximum foam retention time (12 min), indicating superior cleansing and lathering properties. The moisture content of the formulated syndet-based baby soap was found to be 8%, and TFM is 68.4%. Overall, the results demonstrate that the formulated syndet-based baby soap effectively combines cleansing, moisturizing, and protective properties, making it suitable for delicate infant skin. The study highlights the potential application of herbal ingredients in developing safer baby care products, and future research can focus on long-term stability studies, microbial evaluation, and clinical trials to further validate its efficacy and commercial viability.

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