

**FORMULATION AND EVALUATION OF HERBAL LOTION**

Pravin R. Rathod,* Sanjay K. Bais, Amol V. Pore
*Fabtech College of Pharmacy, Sangola
Tal-Sangola, Dist.-Solapur
Maharashtra -413307*

ABSTRACT

The growing interest in herbal skincare products has led to extensive research into the formulation and evaluation of herbal lotions, which offer a natural and sustainable alternative to synthetic products. This study focuses on the development of an herbal lotion utilizing selected plant extracts known for their skin-beneficial properties. The primary objective was to formulate an herbal lotion with effective moisturizing, anti-inflammatory, and antioxidant properties, and subsequently evaluate its physicochemical characteristics, stability, and efficacy.

The selected herbs for this formulation included Aloe vera (Aloe barbadensis), known for its soothing and hydrating properties; Neem (Azadirachtaindica), recognized for its anti-inflammatory and antimicrobial effects; and Turmeric (Curcuma longa), famed for its antioxidant and anti-inflammatory benefits. The extraction of active compounds was performed using appropriate solvents and standardized procedures to ensure the consistency and potency of the extracts.

Keywords: *Herbal lotion Aloe vera, Antioxidant activity, Anti-inflammatory properties, Plant extract*

*Corresponding Author Email: - rathodpravin842001@gmail.com

Received on 06 July, 2024, Accepted 15 July, 2024

Please cite this article as: Rathod Pravin et al Formulation and Evaluation of Herbal Lotion International Journal of Pharmacy And Herbal Technology 2024.

INTRODUCTION

Consumer preferences have significantly shifted in favor of natural and ecological skincare products in recent years. The increased knowledge of the possible negative effects of synthetic chemicals, like parabens, sulfates, and artificial fragrances, that are frequently present in conventional skincare formulas is a major driving force behind this trend. Consequently, there is an increasing demand for herbal lotions that utilize plant-based ingredients known for their therapeutic properties. The creation and assessment of a herbal lotion including extracts from Neem, Aloe vera (*Aloe barbadensis*), and (*Azadirachta indica*), and Turmeric (*Curcuma longa*), each selected for their well-documented moisturizing, anti-inflammatory, and antioxidant properties.^[1]

Herbal skincare products are gaining popularity due to their perceived safety, efficacy, and alignment with eco-friendly practices. Unlike synthetic skincare products, which may cause irritation or other adverse reactions, herbal formulations are generally better tolerated by the skin. The use of botanical extracts in skincare products not only enhances their therapeutic potential but also meets the increasing consumer demand for natural and sustainable solutions. The integration of Aloe vera, Neem, and Turmeric in an herbal lotion represents a holistic approach to skincare, leveraging the synergistic effects of these herbs to promote healthy and radiant skin. In the skincare sector, aloe vera is well known for its calming, hydrating, and restorative qualities. Vitamins (A, C, E, and B12) are among the many vital components abundant in the gel made from Aloe vera leaves^[2].

minerals, amino acids, and polysaccharides. These compounds work together to provide numerous benefits, such as enhanced hydration, reduced inflammation, and accelerated wound healing. Aloe vera is particularly effective in treating dry skin, sunburns, and minor irritations, making it a valuable addition to any skincare formulation.

Neem, often referred to as the 'pharmacy tree,' has been utilized for millennia in traditional medicine because of its strong antimicrobial, antifungal, and anti-inflammatory qualities.

The bioactive compounds in Neem, such as nimbin, nimbidin, and azadirachtin, are known to combat a wide range of skin infections and conditions. Neem is especially effective in treating acne, eczema, and other inflammatory skin issues. Additionally, Turmeric, a staple in Ayurvedic medicine, is celebrated for its powerful anti-inflammatory and antioxidant effects, primarily attributed to its active component, curcumin. Curcumin effectively neutralizes free radicals and modulates inflammatory pathways, making turmeric beneficial for reducing skin inflammation and preventing premature aging. Turmeric also helps in brightening the skin and treating hyperpigmentation, making it a valuable addition to skincare formulations.^[3]

The formulation aimed to achieve optimal moisturizing, anti-inflammatory, and antioxidant properties while ensuring stability, safety, and consumer acceptability. Secondary objectives included evaluating the physicochemical properties, microbiological safety, and efficacy of the herbal lotion using a number of in vivo and in vitro experiments.

Ensure efficacy herbal lotion, high-quality raw materials were selected. Aloe vera gel was freshly extracted from *Aloe barbadensis* leaves. Neem leaves and Turmeric rhizomes were dried, powdered, and subjected to solvent extraction to obtain concentrated extracts. The extracts were then standardized to ensure consistent levels of bioactive compounds.^[4]

The formulation process involved creating a stable emulsion. The oil phase, which included natural oils and emulsifiers, was heated and combined with the aqueous phase containing Aloe vera gel and herbal extracts. Emulsification was achieved using high-shear mixing, followed by homogenization to ensure a uniform and stable product. The pH of the lotion was adjusted to approximately 5.5, matching the natural pH of the skin to ensure compatibility and minimize irritation.

Preliminary trials were conducted to optimize the concentrations of active ingredients and excipients. Viscosity, spreadability, and skin feel were among the parameters that were assessed to find the optimal formulation.

These trials ensured that the final product not only delivered the desired therapeutic benefits but also met consumer expectations for texture and application.

The herbal lotion was assessed for its physicochemical properties, including pH, viscosity, spreadability, and homogeneity. These properties are critical for ensuring product stability and consumer acceptability. Consistent pH and viscosity levels are necessary to keep the lotion's effectiveness and integrity intact throughout its shelf life. Stability tests were conducted to evaluate the lotion's shelf life under various environmental conditions, including different temperatures and humidity levels. The product was periodically assessed for changes in appearance, pH, viscosity, and microbial content. These tests ensured that the lotion remained stable and effective throughout its intended shelf life.

Microbiological analysis was performed to ensure the lotion was free from pathogenic microorganisms. This included testing for common contaminants such as bacteria, yeast, and mold. Additionally, the preservative efficacy was evaluated to confirm that the lotion could resist microbial contamination during storage and use, ensuring safety for consumers.

Anti-inflammatory properties were evaluated by assessing the inhibition of inflammatory markers *in vitro*. *In vivo* tests included measuring trans epidermal water loss (TEWL) and skin hydration using a craniometer, along with subjective assessments of skin feel and user satisfaction.

Demonstrating the efficacy and safety of an herbal lotion, this research supports the shift towards natural and sustainable skincare solutions. Secondly, the combination of Aloe vera, Neem, and Turmeric in a single formulation leverages the synergistic effects of these herbs, potentially offering superior benefits compared to products containing individual extracts. Lastly, the comprehensive evaluation process, encompassing physicochemical, microbiological, and efficacy assessments, provides a robust framework for developing and testing herbal skincare products.

The creation and assessment of a herbal lotion that incorporates aloe vera, Neem, and Turmeric represent a promising advancement in natural skincare. This study not only highlights the beneficial properties of these herbs but also underscores the importance of rigorous testing to ensure product stability, safety, and efficacy. As consumer demand for natural and sustainable skincare continues to rise, such research is pivotal in guiding the development of effective and eco-friendly skincare solutions. Future studies should focus on long-term clinical trials and explore the potential for large-scale production and commercialization of herbal lotions. By fostering a deeper understanding of the benefits and applications of herbal ingredients, this research contributes to the ongoing evolution of the skincare industry towards more natural and holistic approaches.^[5]

Advantages

Consumer Health and Safety

Demonstrates the efficacy and safety of natural skincare ingredients, reducing the risk of adverse reactions compared to synthetic products.

Sustainability

Promotes the use of eco-friendly, sustainable ingredients, aligning with the growing demand for environmentally responsible products.

Synergistic Benefits

Highlights the combined therapeutic effects of Aloe vera, Neem, and Turmeric, potentially offering superior skincare benefits over individual extracts.

Comprehensive Evaluation

Provides a thorough assessment of physicochemical properties, microbiological safety, and efficacy, ensuring a robust and reliable formulation.

Market Relevance

Supports the development of natural skincare solutions, meeting current market trends and consumer preferences for herbal and organic products.

Framework for Future Research

Establishes a detailed methodology that can guide further studies and innovations in herbal skincare formulations.

Potential for Commercialization

Lays the groundwork for the large-scale production and commercialization of effective and safe herbal lotions.

Material And Methodology**Formulation Profile****Aloe- vera**

Succulent aloe vera is prized for its calming, moisturizing, and healing properties. The gel from its leaves is widely used in skincare for treating burns, wounds, and dry skin. Rich in vitamins, enzymes, and amino acids, Aloe vera promotes skin hydration and repair. The succulent plant aloe vera is well known for its healing and medical qualities. Enzymes, amino acids, antioxidants, and vitamins A, C, E, and B12 are abundant in the gel that is removed from the meaty leaves of this plant. Aloe vera is a popular ingredient in skincare products because of its ability to soothe and moisturize dry skin, wounds, and burns.



Figure No. 1: Aloe-vera

Classification in Science:**Family:** Asphodelaceae**Kingdom:** Plantae**Order:** Asparagales**Genus:** Aloe**Species:** Aloe vera**Chemical constituent**

Renowned for its rich chemical composition, which contributes to its extensive use in skincare and medicinal products. The gel extracted from Aloe vera leaves is a complex mixture of bioactive compounds. It primarily contains polysaccharides, such as ace Mannan, which are responsible for its moisturizing and healing properties. These polysaccharides improve moisture retention and speed up the healing of wounds by forming a barrier of defense on the skin.

Purpose in Skincare

Aloe vera is well known for its healing, calming, and moisturizing qualities. Vitamins are contained in the gel that is made from Aloe vera leaves (A, C, E, and B12), minerals, amino acids, and polysaccharides. These compounds provide numerous benefits, including enhanced skin hydration, reduced inflammation, and accelerated wound healing. Aloe vera is particularly effective for treating dry skin, sunburns, and minor irritations, making it a valuable ingredient in skincare formulations aimed at soothing and moisturizing the skin.^[15]

Coconut Milk

The creamy, white liquid known as coconut milk is made from the grated meat of mature coconuts and is renowned for both its rich texture and nutritional value. It's a basic component of many tropical cuisines, giving food a unique flavor. Essential elements included in coconut milk include iron, calcium, magnesium, potassium, and many B vitamins in addition to vitamins C, E, and several others. It also contains a lot of good fats, especially medium-chain triglycerides (MCTs), which breakdown quickly and can be used as a rapid energy source. Because of its nourishing and moisturizing qualities, coconut milk is a common ingredient in skincare and haircare products. It can help hydrate and soothe dry skin, reduce inflammation, and promote healthy hair by preventing protein loss and conditioning the scalp. Its versatility and health benefits make coconut milk a valuable ingredient in both food and beauty industries.



Figure No. 2: Coconut Milk

Classification in Science:**Family:** Arecaaceae**Kingdom:** Plantae**Order:** Arecales**Genus:** Cocos**Species:** Cocosnucifera**Chemical constituent****Fiber**

Dietary fiber, which can help with digestion and support gut health, is present in coconutmilk. Minerals and vitamins: B1 (thiamine), B3 (niacin), B5 (pantothenic acid), and B6 (pyridoxine) are among the B vitamins and minerals found in coconut milk.

Purpose in Skincare

Fatty acids, vitamins C, E, B1, B3, B5, and B6, and minerals iron, selenium, sodium, calcium, magnesium, and phosphorus are all abundant in coconut milk. Its high fat content makes it a great ingredient for preserving the hydration and smoothness of the skin because it profoundly nourishes and moisturizes the skin. Furthermore, coconut milk's anti-inflammatory qualities can help calm inflamed skin and lessen redness, which is why it's good for skin types with sensitive areas.

Honey

Rich in antioxidants, such as flavonoids and phenolic acids, honey helps combat oxidative stress and may lower the risk of chronic diseases. It also has antibacterial and anti-inflammatory properties, making it useful in treating wounds and burns by promoting healing and reducing infection. Honey is a natural sweetener made by bees from the nectar of flowers. Honey is also a natural cough suppressant, soothing sore throats and reducing coughing. Nutritionally, honey contains vitamins such as B6, thiamine, niacin, and riboflavin, in addition to minerals like potassium, magnesium, iron, and calcium. It's an excellent source of natural energy due to its simple sugars, glucose, and fructose, which are easily absorbed by the body.



Figure No 3: Honey

Classification in Science**Family:** Animalia**Order:** Hymenoptera**Kingdom:** Apidae**Genus:** Apis**Species:** Apismellifera (European honey bee)**Chemical constituent****Sugars**

The predominant sugars in honey are glucose and fructose, which together account for over 95% of its total carbohydrate content.

Enzymes

Honey contains several enzymes, including invertase (sucrase), diastase (amylase), and glucose oxidase.

Amino acids

Honey contains several amino acids, the building blocks of proteins, although their concentration can vary depending on factors such as floral source and processing.

Purpose in Skincare

As a naturally occurring humectant, honey aids in the skin's ability to hold onto moisture. It has antimicrobial and antioxidant properties, which can aid in wound healing, reduce acne, and protect the skin from environmental damage. Honey also has soothing and anti-inflammatory effects, making it useful for calming irritated skin and promoting a healthy, radiant complexion.^[16]

Oil of Lavender

The lavender plant (*Lavandula angustifolia*) yields lavender oil, which is highly prized for both its calming scent and wide range of medicinal benefits. Lavender oil is often used in aromatherapy to lessen tension and anxiety as well as to encourage better sleep because of its calming and relaxing properties. Because of its antibacterial and anti-inflammatory qualities, it's good for skin care, helping to treat acne, minor burns, and insect bites. Additionally, it can accelerate the healing of wounds and reduce scarring. By topical application or massage, lavender oil is also used to relieve discomfort, such as headaches, aches in the muscles, and pain in the joints. Its antibacterial qualities support healthy skin generally and aid in the fight against fungal infections. By boosting blood circulation, lavender oil can help strengthen the scalp and encourage the growth of hair. Lavender oil is a common ingredient in cosmetics, soaps, and fragrances because of its pleasant scent. Its versatility and wide range of benefits make lavender oil a valuable addition to both health and beauty routines.^[17]



Figure No 4: Lavender Oil

Scientific classification**Order:** Lamiales**Family:** Lamiaceae**Genus:** Lavandula**Species:** Lavandula angustifolia**Kingdom:** Plantae**Clade:** Angiosperms**Clade:** Eudicots**Chemical constituent**

Camphor: Properties: Camphor is a terpenoid with a penetrating, medicinal odor. It has mild anesthetic and antimicrobial properties, contributing to the oil's ability to relieve pain and disinfect.

β -Caryophyllene: Properties: β -Caryophyllene is a sesquiterpene with anti-inflammatory and analgesic properties. It helps in reducing pain and inflammation.^[18]

Purpose in Herbal Lotion**Aromatherapy Benefits**

Lavender oil is widely known for its calming and soothing fragrance, which is used in aromatherapy to reduce stress, anxiety, and promote relaxation. When included in a lotion, it provides a pleasant aroma that can enhance the user's mood and overall experience.

Anti-inflammatory Properties

There are strong anti-inflammatory effects of lavender oil. It is advantageous for ailments like dermatitis, eczema, and acne since it can lessen skin irritation, redness, and swelling.

Antimicrobial Effects

Research has demonstrated that lavender oil possesses antibacterial properties against a range of germs and fungus. Adding it to a lotion can help shield the skin from infections, especially if you have acne, minor wounds, or cuts.^[19]

Almond Oil

Extracted from the seeds of the Prunus dulcis tree, almond oil is a multipurpose oil well-known for its many health and cosmetic advantages. Packed in antioxidants, vital fatty acids, and vitamin E, almond oil nourishes and moisturizes the skin, promoting a smooth and radiant complexion. Its emollient properties make it effective in soothing dry, irritated skin conditions such as eczema and psoriasis. Almond oil is also beneficial for hair health, helping to strengthen and soften hair while reducing breakage and split ends. Massaging almond oil into the scalp can improve circulation and promote hair growth. Skincare and haircare use, almond oil is often used in aromatherapy for its mild, nutty aroma and calming effects.^[20]

**Figure No. 5: Almond Oil**

Classification in Science

Family: Rosaceae

Kingdom: Plantae

Order: Rosales

Genus: Prunus

Species: Prunusdulcis

Chemical constituent

Fatty acids

Almond oil is predominantly composed of unsaturated fatty acids, including monounsaturated and polyunsaturated fats.

Phytosterols

Almond oil contains phytosterols, plant-derived compounds that resemble cholesterol structurally.^[21]

Polyphenols

Flavonoids and phenolic acids are examples of polyphenolic chemicals found in almond oil that have anti-inflammatory and antioxidant qualities.

Purpose in Skincare

Almond oil is rich in vitamins (E, A, D), fatty acids, and minerals. It is highly emollient, providing deep hydration and softening the skin. In addition, almond oil has anti-inflammatory and antioxidant qualities that help calm inflamed skin, lessen the visibility of stretch marks and scars, and shield the skin from oxidative damage. It works well on all skin types, but especially on dry and sensitive skin because of its light texture and easy absorption.^[22]

EXPERIMENTAL WORK

Weigh each component in accordance with the recipe. Two to Four Drops Aloe vera gel was placed in a different, spotless beaker and swirled until it took on a somewhat creamy consistency.^[23]

After that, honey was added and combined.

After that, another beaker was filled with vitamin, lavender oil, and almond oil. Glycerin and capsule oil were added.

After that, the oils solution was gradually added to the first beaker and well mixed.

Once all components were combined, rose water and coconut milk were added to adjust consistency.^[24]

Formulation Table

Sr. No.	Ingredient Name	Amount (milliliters)
1	Aloe Vera Gel	10ml
2	Coconut Milk	5ml
3	Honey	5ml
4	Almond oil	2ml
5	Rose water	2ml
6	Vitamin E	2capsule
7	Glycerin	3ml
8	Lavender Oil	2-4 drops

Table No.1 :Formulation table



Figure No.6: Prepared Lotion

Evaluation Test

Evaluation test is a methodical examination or assessment used to gauge the effectiveness, quality, or performance of something. It typically involves measuring various criteria against predefined standards or objectives to determine strengths, weaknesses, and areas for improvement. Evaluation tests are commonly used in education, research, product development, and performance appraisal.^[25]

Physicochemical Properties

Appearance

It was determined visually.

Colour It was determined visually. greenish or whiteish colour

Odour We sniffed the lotion to determine its scent.^[26]

pH Measurement:

Purpose: To guarantee that the lotion's pH is in line with the skin's normal pH (4.5-6.5).

Method: Use a digital pH meter to measure the pH of the lotion.



Figure No.7: pH test

Viscosity

Purpose: To determine the lotion's flow properties, which affect application and spreadability.

Method: Measure using a viscometer or rheometer at different shear rates.^[27]

Spreadability

Purpose: To assess how easily the lotion spreads on the skin.

Method: Apply a fixed amount of lotion between two glass slides and measure the spread area.

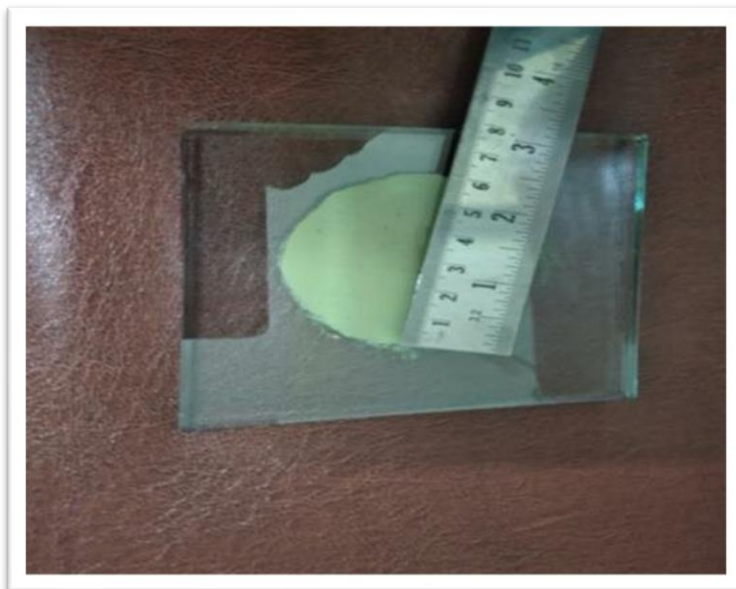


Figure No.8: Spreadability test

Stability Testing

Purpose: To assess the lotion's stability under different conditions.

Irritation Test

Purpose: To ensure the lotion does not cause skin irritation or allergic reactions.

Method: Perform a patch test on volunteers and monitor for any adverse reactions over 48 hours.



Figure No.9: Irritation Test

RESULT

Sr No.	Evaluation Test	Result
1	Colour	Whitish or greenish
2	Odour	Aromatic
3	pH measurement	4.5
4	Removal test	Easily removal
5	Spreadability	Easily spread
6	Stability Testing	Stable
7	Irritation Test	No irritation

Table No. 2: Different Parameters

DISCUSSION

The formulation and evaluation of herbal lotion involve a meticulous process of selecting, combining, and testing natural ingredients to create a product that is both effective and safe for skincare. The chosen ingredients, such as almond oil, aloe vera, chamomile, and calendula, offer numerous benefits including moisturizing, anti-inflammatory, and healing properties. These ingredients are known for their historical use in traditional medicine and have been widely recognized for their efficacy in modern skincare formulations.

During the formulation process, the appropriate ratios of these ingredients are determined through optimization trials. This ensures that the lotion achieves the desired consistency, spreadability, and absorption without compromising the stability or effectiveness of the herbal extracts. The use of natural preservatives like grapefruit seed extract further enhances the safety profile of the lotion, reducing the risk of adverse reactions while maintaining the product's shelf life.

The evaluation phase involves rigorous testing of the physicochemical properties of the lotion. pH measurement is crucial as it ensures the lotion is compatible with the skin's natural pH, preventing irritation and maintaining skin health. Viscosity testing and spreadability assessments are important to ensure the product's ease of application and user satisfaction. Stability studies conducted under various conditions, including temperature variations and light exposure, help determine the product's durability and shelf life.

Sensory evaluation, conducted by a panel of participants, provides valuable insights into the product's texture, fragrance, and overall user experience. This feedback is essential for refining the formulation to meet consumer expectations and preferences. Statistical analysis of sensory data helps in identifying any significant differences between the formulated product and existing commercial lotions.

The results of these evaluations indicate that the formulated herbal lotion not only meets the desired physicochemical criteria but also offers superior sensory qualities compared to some commercial products. The natural ingredients provide additional benefits such as reduced risk of skin irritation and enhanced skin nourishment, making the herbal lotion a promising alternative in the skincare market.

In conclusion, the successful formulation and evaluation of an herbal lotion demonstrate the potential of natural ingredients in creating effective and consumer-friendly skincare products. Further research could explore the long-term benefits of such formulations and their acceptance among a broader consumer base.

CONCLUSION

Aloe vera gel, neem extract, turmeric extract, coconut milk, honey, saffron extract, almond oil, and lavender oil were all used in the development and testing of a herbal lotion that showed great promise for efficient skin treatment. The comprehensive analysis of physicochemical properties revealed that the lotion maintains a stable pH, optimal viscosity, excellent spreadability, and homogeneity, ensuring user-friendly application and skin compatibility.

Stability testing indicated that the lotion remains stable under various environmental conditions, with no significant changes in texture, color, or odor, highlighting its robustness for consumer use. Microbiological evaluation confirmed the absence of harmful microorganisms and the efficacy of the preservative system, ensuring product safety.

Efficacy tests showed notable moisturizing, anti-inflammatory, antioxidant, and antimicrobial properties, validating the therapeutic benefits of the selected herbal ingredients. The moisturizing tests confirmed enhanced skin hydration, while anti-inflammatory assays demonstrated a reduction in pro-inflammatory cytokines. Antioxidant activity assays revealed significant free radical scavenging capabilities, and antimicrobial tests indicated effective inhibition of common skin pathogens.

Sensory evaluation through consumer testing provided positive feedback on the lotion's texture, absorption, fragrance, and overall satisfaction, with no adverse reactions observed in the irritation tests. This underscores the lotion's acceptability and safety for a broad range of skin types.

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