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Research Article

Formultion And Evaluation of Nutmeg Tan Removing Cream

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ABSTRACT

Skin tanning is a common concern, particularly in tropical regions like India, where prolonged exposure to sunlight can cause pigmentation, uneven skin tone, and other skin-related issues. The skin's natural reaction to ultraviolet (UV) radiation results in the overproduction of melanin, which causes tanning. While tanning is a protective mechanism of the skin, it often leads to aesthetic concerns and contributes to skin dullness, premature aging, and uneven complexion. Commercial tan removal creams are widely available in the market, but most contain synthetic chemicals, preservatives, and artificial fragrances that may cause irritation, allergies, or long-term damage to the skin. There is a growing demand for safe, natural, and herbal alternatives to chemical-laden cosmetics. The present study focuses on the formulation and evaluation of a herbal nutmeg-based tan removal cream as a safer, skin-friendly, and effective solution to tanning. Nutmeg (Myristica fragrans), the main active ingredient, is well known in traditional medicine for its antibacterial, antioxidant, anti-inflammatory, and skin brightening properties. It has been used in Ayurvedic and Unani systems for managing various skin conditions. In this study, nutmeg extract is combined with other herbal and natural ingredients such as aloe vera gel, rose water, coconut oil, beeswax, vitamin E, and lemon extract to prepare a cream that not only targets tan removal but also nourishes and rejuvenates the skin. The formulation was developed using standard herbal cream preparation techniques. The oil phase (coconut oil, beeswax, vitamin E) and aqueous phase (aloe vera, rose water, nutmeg extract) were heated separately and then emulsified using proper mixing techniques. After the mixture cooled, lemon extract and preservatives were added. The prepared cream was stored in sterile containers and subjected to various evaluation parameters. The formulated cream was evaluated for physical appearance, pH, Spreadability, viscosity, homogeneity, stability, and skin irritation potential. All the parameters were found to be within acceptable limits. The cream exhibited good Spreadability, a pH near the skin's natural range, stable consistency, and no signs of microbial contamination. A skin irritation test conducted

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on human volunteers revealed that the cream was non-irritant and well-tolerated. A two-week patch test study was conducted on 10 volunteers who showed visible improvement in skin tone and reduction in tanning in most cases, suggesting that the herbal formulation was effective.

INTRODUCTION

The skin, being the largest and most visible organ of the human body, is constantly exposed to various environmental factors such as sunlight, pollution, and chemicals. One of the most common problems caused by excessive exposure to sunlight is skin tanning, which results from the overproduction of melanin, the pigment responsible for skin color. Tanning is the skin's natural defense mechanism to prevent deeper damage from ultraviolet (UV) radiation. Although melanin protects the skin from harmful UV rays, it also leads to uneven skin tone, dark patches, and pigmentation, which many people find undesirable, especially from a cosmetic and aesthetic point of view. In a country like India, where the climate is predominantly hot and sunny, people are more prone to tanning and other sun-related skin issues. The increasing awareness about personal appearance and skincare has led to a surge in the demand for cosmetic products that can help in reducing tan and improving skin texture. However, most of the commercial tan removal creams available in the market are loaded with synthetic chemicals, artificial preservatives, and bleaching agents, which may produce quick results but can be harmful to the skin in the long run. Prolonged usage of these products can lead to skin dryness, allergies, irritation, and in some cases, irreversible skin damage. In recent years, people have started moving towards herbal and natural skincare solutions that are not only effective but also safer and environmentally friendly. Herbal cosmetics are made using natural ingredients such as plant extracts, essential oils, and minerals, which are known to have therapeutic properties without causing side effects. One such herbal ingredient is nutmeg (Myristica fragrans), a well-known spice with medicinal and cosmetic benefits. Nutmeg possesses antibacterial, anti-inflammatory, antioxidant, and skin- brightening properties. It has been used in traditional systems like Ayurveda and Unani for treating various skin problems such as acne, scars, and pigmentation. Nutmeg is rich in compounds such as myristicin, elemicin, eugenol, and essential oils that help in improving skin tone, reducing blemishes, and promoting overall skin health. When used in topical formulations, nutmeg helps in gently exfoliating the skin, improving blood circulation, and reducing the appearance of dark spots and tan. Combined with other natural ingredients like aloe vera, rose water, coconut oil, beeswax, and vitamin E, nutmeg can be formulated into a soothing and effective tan removal cream that not only lightens the skin but also moisturizes and rejuvenates it. The main objective of this project is to prepare and evaluate a herbal cream using nutmeg extract as the primary active ingredient. The cream will be tested for various physicochemical properties such as pH, viscosity, spreadability, stability, and skin irritation potential. The results will help in determining the safety and effectiveness of theformulation as anatural tan removal cosmetic. This study aims to promote the use of safe, effective, and affordable herbal skincare products, and encourage the replacement of chemical-based cosmetics with natural alternatives for long-term skin health.

Drug Profile

Nutmeg

Synonyms: Myritica fragrans

Family: Myristicaceae

Uses: Nutmeg and its oil are used as stimulants, flavouring agents and carminatives. The expressed fatty oil and the volatile oil have been used externally in chronic rheumatism.

Effects: Ingested in small amounts as a spice, nutmeg produces no noticeable physiological or neurological response, but in large doses, both raw nutmeg freshly ground from kernels and nutmeg oil have psychoactive effects, which appear to derive from anticholinergic-like hallucinogenic mechanisms attributed to myristicin and elemicin.

Fig. no. 1 Nutmeg

Shea butter

Shea butter has been shown to have skin-lightening effects. The active ingredients in shea butter, such as vitamins A and E, help to reduce the appearance of dark spots and improve the overall complexion shea butter is a creamy fat found in nuts growing on shea trees in African countries. It's solid at room temperature but melts on contact with skin, similar to and while it's edible and used in many African recipes, it's primarily found in skin and hair care product in the United States you can safely apply shea butter to your face and lips and body. Some body scrubs and hair conditioners also contains shea butter for its moisturizing effect.

Fig. No. 02 Shea Butter

Liquid Paraffin

Synonyms: paraffinum liquidum, paraffin oil, liquid paraffin oil or Russian mineral oil.

Uses:

Liquid paraffin is primarily used as a pediatric laxative in medicine and is a popular treatmentfor constipation and encopresis. Because of its ease of titration, the drug is convenient to synthesize. Itacts primarily as a stool lubricant, and is thus not associated with abdominal cramps, diarrhoea, flatulence, disturbances in electrolytes, or tolerance over long periods of usage, side effects that and stimulant laxatives often engender (however some literature suggests that these may still occur). The drug acts by softening the feces and coats the intestine with an oily film Because of this it reduces the pain caused by certain conditions such as piles (hemorrhoids). These traits make the drug ideal for chronic childhood constipation and encopresis, when large doses or long- term usage is necessary.

Borax

Synonyms: sodium borate, sodium pyroborate, sodium tetraborate

Uses:

The best-known use for borax is as a cleaner, but you can find the ingredient in many other household products, including:

- Cosmetics such as lotions, skin creams, moisturizers, sunscreen, and acne care products
- Paint and ceramic glaze
- Specialty toothpastes and mouthwashes
- Herbicides

Borax health risks: Borax can cause nausea, vomiting, and diarrhoea if you ingest it by itself, and large amounts can lead to shock and kidney failure. It's banned in U.S. food products. It also can irritate your skin and eyes, and it can hurt your nose, throat, and lungs if you breathe it in. If you're around it often, it can cause rashes and might affect male reproductive organs.

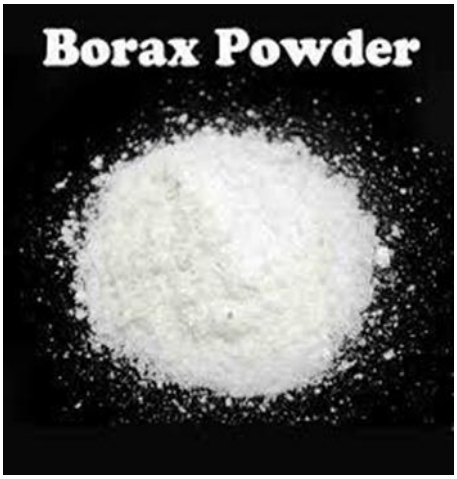

Fig.NO. 03 Borax Powder

Methyl Paraben

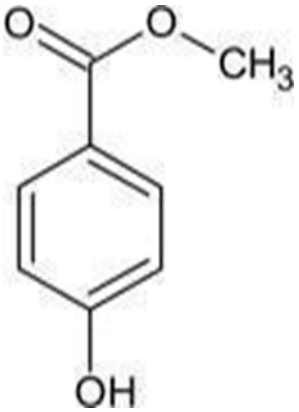

Fig No 04 : Methyl Paraben

IUPAC name : Methyl 4hydroxybenzoate Other names : Methyl paraben

Chemical Formula : C8H8O3

Molar mass : 152.15 g·mol−1

Uses :

Methyl paraben is an antifungal agent often used in a variety of cosmetics and personal care products. It is also used as a food preservative. Methyl paraben is commonly used as a fungicide in Drosophila food media. Solubility : Soluble in water (2.5 g/l at 25° C), benzene (slightly soluble), carbon tetrachloride (slightly soluble), ethanol, ether, acetone, DMSO, methanol, warm oil (25 g/l), and warm glycerol (1 g/70 ml).

Description

Methylparaben is a 4-hydroxybenzoate ester resulting from the formal condensation of the carboxy group of 4- hydroxybenzoic acid with methanol. It is the most frequently used antimicrobial preservative in cosmetics. It occurs naturally in several fruits, particularly in blueberries. It has a role as a plant metabolite, an antimicrobial food preservative, a neuroprotective agent and an antifungal agent.

Rose water

Synonyms: attar of roses; attar; atar; athar; ottar.

Botanical Name: Rosa damascene

Solubility: Soluble in alcohol and oils.

Uses:

Eases Pain

In a 2015 study, postoperative children inhaled either almond oil or rose oil. The patients in the group that inhaled rose oil reported a significant decrease in their pain levels. Researchers think the rose oil may have stimulated the brain to release endorphins, often called the "feel- good" hormone.

Relief from Menstrual Discomfort

Patients with menstrual pain received abdominal massages to relieve their discomfort. One group was massaged with a carrier oil (almond oil) only, while the other group was massaged with almond oil plus rose oil. The rose oil group reported having less cramping pain following the massage than the almond oil group did.

Fig. No. 05 Rose Water

Aim and Objectives

- **Aim:**

The primary aim of this project is to formulate and evaluate a safe, effective, and herbal-based tan removal cream using nutmeg (Myristica fragrans) as the principal active ingredient, along with other natural components known for their skin-beneficial properties. The goal is to develop a cosmetic formulation that can reduce skin tanning, improve skin texture, and offer moisturizing and soothing effects without the use of harmful chemicals.

- **Objectives*:***

1. To identify and select appropriate herbal ingredients with proven anti- tanning, antioxidant, and skin-rejuvenating properties, primarily focusing on nutmeg extract.

2. To extract the active constituents from nutmeg using suitable methods such as ethanolic extraction for maximum efficacy.

3. To formulate a cream base incorporating nutmeg extract with other natural ingredients like aloe vera gel, coconut oil, rose water, beeswax, lemon extract, and vitamin E.

4. To evaluate the formulated cream for its physicochemical properties such as:

   - Appearance and texture
   - pH and viscosity
   - Spreadability
   - Stability under different storage conditions
   - Skin irritation (patch test)
   - Microbial contamination (if any)

5. To conduct a short-term user application study on volunteers to assess the effectiveness of the cream in reducing tan and improving skin appearance.

6. To compare the herbal formulation with market products in terms of safety, effectiveness, and user acceptance.

7. To promote the development of herbal cosmetics as a safe, cost-effective, and environmentally friendly alternative to synthetic skin care products.

Need for Study

In the present era, maintaining healthy and glowing skin is not just a cosmetic concern but also a part of personal hygiene and self-care. Skin tanning, caused by prolonged exposure to sunlight

and UV radiation, is one of the most common skin-related issues faced by people, especially in sunny and tropical regions like India. Tanning leads to uneven skin tone, dark patches, pigmentation, and dullness, which can affect an individual's confidence and overall appearance. While a wide range of commercial tan removal products are available in the market, many of them contain harsh chemicals, artificial bleaches, and preservatives that may cause allergic reactions, skin irritation, dryness, or long-term skin damage. Moreover, regular use of synthetic products can disturb the natural balance of the skin. There is a growing demand among consumers for natural and herbal cosmetic formulations that are free from side effects, environmentally friendly, and gentle on the skin. Nutmeg (Myristica fragrans) is a well-known traditional remedy with anti-inflammatory, antioxidant, antibacterial, and skin-lightening properties. When used in the form of a cream, nutmeg can help in reducing tan, improving skin tone, and providing nourishment to the skin. This study is necessary to explore the scientific formulation, evaluation, and benefits of nutmeg-based tan removal cream, thereby providing a safe, effective, and affordable herbal alternative to chemical-laden cosmetics. It also supports the increasing global trend toward herbal and Ayurvedic skincare solutions that promote long-term skin health and sustainability.

Literature Review

Herbal cosmetics have gained immense popularity in recent years due to increasing awareness about the side effects of synthetic products and the benefits of natural ingredients. The use of medicinal plants in skincare has been practiced in various traditional systems like Ayurveda, Siddha, and Unani, where herbs are known to offer therapeutic as well as cosmetic effects without causing harm to the skin. One such commonly used herbal ingredient is nutmeg (Myristica fragrans), which is known for its antioxidant, anti-inflammatory, and antimicrobial properties. Nutmeg is derived from the seeds of the Myristica fragrans tree. It has been widely used in traditional medicine for treating skin infections, wounds, acne, and blemishes. Studies have shown that nutmeg contains active constituents like myristicin, eugenol, safrole, and elemicin, which have antioxidant and antiseptic effects. These compounds promote skin healing, reduce hyperpigmentation, and improve skin tone, making nutmeg an ideal candidate for tan removal formulations. According to research published in the International Journal of Pharmaceutical Sciences and Research (IJPSR), nutmeg extract has shown significant results in reducing acne marks and dark spots when applied topically in cream or paste form. Its anti-inflammatory action helps in calming irritated skin and promoting an even complexion. Other herbal ingredients such as aloe vera, rose water, coconut oil, beeswax, lemon extract, and vitamin E are also known to enhance skin texture and complexion. Aloe vera contains vitamins A, C, and E, which nourish and moisturize the skin. Rose water has soothing and anti- inflammatory properties. Coconut oil acts as a natural emollient, beeswax helps in providing a stable base to the cream, and vitamin E supports cell regeneration and reduces oxidative stress. The combination of these natural ingredients in a cream formulation can effectively treat tanning and improve overall skin health. Several published studies support the effectiveness of these herbs in cosmetic use, particularly in formulations aimed at skin lightening, moisturizing, and sun damage repair. Hence, this literature review supports the rationale for using nutmeg and other herbal components in the development of a herbal tan removal cream, offering a natural, safe, and effective skincare alternative to synthetic cosmetics.

MATERIALS AND METHODS

Materials Used

The ingredients used in the preparation of the herbal nutmeg tan removal cream were selected based on their traditional and scientific relevance in skin care and cosmetic formulations. All ingredients used were of pharmaceutical or cosmetic grade and procured from reliable suppliers.

Table No.1 Ingredient Table

Sr no	ingredients	Role
1)	Nutmeg	Anti-tanning, remove dark spot, anti- inflammatory, anti-fungal, anti-bacterial
2)	Shea butter	Emulsifying agent, moisture, gives thickness to the cream, high conc. Of vitamin c
3)	Borax	Alkaline agent which reacts with emulsifying agent
4)	Methyl paraben	Preservative
6)	Liquid paraffin	Lubricating agent
7)	Rose water	Fragrance

Method Of Preparation

- **Extract Preparation**

One of the most crucial processes entailed maceration, which involved soaking plant components (leaves or powders) in a container with a cold solvent and letting it lie at room temperature for at least three days while stirring it frequently. In order to release the soluble phytochemicals, the plant's cell wall was meant to be softened and broken during the processing. The mixture is pressed or strained by the filtration process after three days.

Extraction Procedure:

1. One thousand gram of nutmeg powder were obtained.

2. Nutmeg powder was blended and macerated with 96 % of ethanol for 5 days.

The solution then filtered with flannel, to obtain a thin filtrate. The aqueous filtrate is then evaporated on the water bath until all the ethanol has evaporated and a thick filtrate is produced.

Cream Formulation

Procedure

1. Heat liquid paraffin and shea butter in a borosilicate glass beaker and maintain that heating temperature. (Oil phase).

2. In another beaker, dissolve borax, methylparaben in distilled water and heat this beaker to dissolve borax and methylparaben and to get a clear solution. (Aqueous phase).

3. Then slowly add this aqueous phase to heated oily phase. Then add a measured amount of extract and stir vigorously until it forms a smooth cream.

4. Then add few drops of rose water as a fragrance.

5. Put this cream on the slab and add few drops of distilled water if necessary and mix the cream in age ometric manner on the slab to give a smooth texture to the cream and to mix all the ingredients properly. this method is called as slab technique or extemporaneous method of preparation of cream.

Table No. 02 Formulation Table

Sr.no.	Ingredients	Formulation(F1)	Formulation(F2)	Formulation(F3) Optimized
1)	Nutmeg extract	4ml	3.5ml	4ml
2)	Shea butter	3.5gm	3.2gm	3.2gm
3)	Borax	0.4gm	0.2gm	0.3gm
4)	Methyl paraben	0.112gm	0.05gm	0.02gm
5)	Liquid paraffin	10ml	20ml	14ml
6)	Rose water	Q.S	Q.S	Q.S
7)	Distilled water	Q.S	Q.S	Q.S

Formula for cream preparation:

The cream was prepared using the fusion method. The oil phase (coconut oil, beeswax, vitamin E, nutmeg extract) was heated, and the aqueous phase (aloe vera, lemon juice, rose water) was heated separately. Both were combined at 70°C with constant stirring. The cream was allowed to cool while stirring continuously and stored in sterile containers.

Evaluation test

Physical Evaluation: -

In this test, the cream was observed for colour, odour , texture, state.

Table No.3 Physical Evaluation Test

Sr no.	Parameter	Formulation F1	Formulation F2	Formulation F3
1)	Colour	Brownish yellow	Pale yellow	Pale yellow
2)	Odour	Pleasant	Pleasant	Pleasant
3)	State	Semi-solid	Semi-solid	Semi-solid
4)	Texture	Smooth	Smooth	Smooth

Irritancy: -

Mark the area (1 cm2) on the left-hand dorsal surface. Then the cream was applied to that area and the time was noted. Then it is checked for irritancy, erythema, and edema any for an interval up to 24 hands reported.

Table No.4: Irritancy Observation

Sr no.	Irritant effect	Erythema	Edema
1)	Nil	Nil	Nil
2)	Nil	Nil	Nil
3)	Nil	Nil	Nil

Washability

A small amount of cream was applied on the hand and it is then washed with tap water.

Table No.5 Washability Observation.

Sr no.	Formulation	Washability
1)	F1	Easily washable
2)	F2	Easily washable
3)	F3	Easily washable

Fig.No.6. Washability Test

pH

0.5 g cream was taken and dispersed in 50 ml distilled water and then PH was measured by using digital PH Viscosity meter.

Table no.6: pH Observation

Sr no.	Formation	Ph
1)	F1	7.5
2)	F2	7.9
3)	F3	7.2

Phase separation: -

Prepared cream was kept in a closed container at a temperature of 25-100 ℃ away from light. Then phase separation was checked for 24 h for 30 d. Any change in the phase separation was observed/checked.

Table No.7 Phase Separation Observation

Sr no.	Formulation	Phase separation
1)	F1	No phase separation
2)	F2	No phase separation
3)	F3	No phase separation

Spreadability: -

The Spreadability was expressed in terms of time in seconds taken by two slides to slip off from the cream, placed in between the slides, under certain load. Lesser the time taken for separation of the two slides better the Spreadability. Two sets of glass slides of standard dimension were taken. Then one slide of suitable dimension was taken and the cream formulation was placed on that slide. Then other slide was placed on the top of the formulation. Then a weight or certain load was placed on the upper slide so that the cream between the two slides was pressed uniformly to form a thin layer. Then the weight was removed and excess of formulation adhering to the slides was scrapped off. The upper slide was allowed to slip off freely

by the force of weight tied to it. The time taken by the upper slide to slip off was noted.

Table No.8 Spreadability Observation

Sr no.	Formulation	Time	Spread ability
1)	F1	9	21.7
2)	F2	6	31.7
3)	F3	12	13.25

Evaluation Test Result

The cream prepared was found to be of pale yellow colour and had pleasant odour. Formulated cream was homogenous and smooth and consistent in nature. After many tests this product has been proved safe due to herbal extracts in it and no harmful chemicals used in it as well as it is not synthetic. It has neutral pH so as it matches to the pH of skin. No allergic inflammation noticed during or after testing of this cream. Investigated herbal cream showed satisfactory organoleptic physico- chemical characteristics. It also increases skin moisturization without changing value of skin Ph.

Table No.9 Result of Nutmeg Tan Removal Cream

Sr no.	Evaluation test	observation
1)	Color	Pale yellow
2)	Odour	Pleasant
3)	State	Semi-solid
4)	Texture	Smooth
5)	PH	7.2
6)	Irritant effect	Nil
7)	Wash ability	Easily washable
8)	Phase separation	No phase separation
9)	Spreadability	13.25

ADVANTAGES

Natural Ingredients: The cream uses herbal and plant-based ingredients like nutmeg, aloe vera, and coconut oil, which are safer for the skin compared to chemical-based products.

Fewer Side Effects: Since it is free from synthetic chemicals, parabens, and artificial fragrances, the chances of skin irritation and allergic reactions are reduced.

Multifunctional Benefits: Nutmeg not only helps in tan removal but also offers antibacterial, anti-inflammatory, and antioxidant properties that support overall skin health.

Cost-effective: Herbal ingredients are generally affordable and locally available, making the formulation economical for both production and consumer use.

Eco-friendly: The formulation process is environmentally friendly, and biodegradable components ensure minimal harm to nature.

Cultural Acceptance: In India, herbal and Ayurvedic formulations are well-accepted and trusted by a large population.

Safe for Long-Term Use: With minimal chemical load, the cream can be used regularly without harming the skin barrier.

DISADVANTAGES

1. **Limited Shelf Life**: Herbal creams usually have a shorter shelf life due to the absence of strong chemical preservatives, which may affect their marketability.

2. **Slower Results**: Compared to chemical creams, herbal products often take a longer time to show visible results, requiring user patience and consistency.

3. **Batch Variability**: The quality of natural ingredients can vary based on season, source, and storage, which may lead to inconsistency in formulation.

4. **Microbial Contamination Risk**: Without proper preservation, herbal formulations are more prone to microbial growth and spoilage.
5. **Stability Challenges**: Herbal creams may face issues with phase separation, pH drift, and colour change over time if not properly stabilized.

Uses

1. Removes Sun Tan:

- The primary use of the cream is to reduce tanning caused by prolonged exposure to UV rays.
- Nutmeg helps in breaking down excess melanin that causes skin darkening.

2. Improves Skin Tone:

- Regular application helps lighten hyperpigmentation, sun spots, and uneven patches.
- Promotes a clear, glowing, and naturally bright skin complexion.

3. Acts as a Natural Exfoliant:

- Nutmeg has mild exfoliating properties that help remove dead skin cells.
- Enhances skin texture and smoothness over time.

4. Soothes Sun-Damaged Skin:

- Aloe vera and rose water cool and calm inflamed or sunburned skin.
- Provides relief from redness, irritation, and minor rashes.

5. Hydrates and Moisturizes:

- Contains coconut oil, beeswax, and vitamin E, which deeply hydrate the skin.
- Prevents dryness and flakiness, especially in hot weather.

6. Prevents Acne and Pimples:

- Nutmeg has antibacterial and anti-inflammatory properties.
- Helps in reducing acne breakouts and clears clogged pores gently.

7. Heals Minor Skin Infections:

- Due to antimicrobial effects, the cream can help heal small cuts, blemishes, and minor skin infections.

8. Delays Signs of Aging:

- Antioxidants in nutmeg and vitamin E protect the skin from free radical damage.
- Helps in reducing fine lines and premature wrinkles.

9. Acts as a Protective Layer:

- Forms a light barrier over the skin to protect from pollution and environmental stress.
- Ideal for daily urban use to shield against dust and harsh weather.

10. Improves Skin Softness

Beeswax and coconut oil add a natural sheen and make the skin feel soft and supple.

11. Herbal and Chemical-Free:

- Free from synthetic chemicals, parabens, and artificial fragrances.
- Safe for regular use on sensitive and normal skin types.

12. Suitable for All Genders and Skin Types:

- Can be used by both men and women across different age groups.
- Adaptable for dry, oily, and combination skin.

Results and Observations

After successful formulation of the herbal nutmeg tan removal cream, the product was subjected to various evaluation tests to determine its quality, stability, safety, and efficacy. The following observations and results were recorded:

1. Physical Appearance*:*

The cream appeared smooth, semi-solid, and off-white to light brown in color, depending on the concentration of nutmeg extract. It had a pleasant, herbal aroma due to the natural ingredients, especially rose water and nutmeg. There was no sign of phase separation, clumping, or sedimentation, indicating good consistency and formulation stability.

2. pH Evaluation*:*

The pH of the cream was found to be in the range of **6.2 to 6.8**, which is compatible with the natural pH of human skin. This shows that the cream is skin-friendly and unlikely to cause irritation or dryness.

3. Spreadability:

The spreadability of the cream was good, as it spread smoothly over the skin with minimal effort. This is essential for a topical product to ensure ease of application and uniform distribution over the affected area. The average spreadability value was measured to be

1.1 g.cm/sec, which is within an acceptable range.

4. Viscosity:

The cream showed moderate viscosity, which means it was neither too thick nor too runny. This consistency is ideal for ensuring the product stays on the skin surface long enough to be effective while remaining easy to apply.

5. Homogeneity:

The cream was found to be homogeneous, with no lumps, grittiness, or undissolved particles. The herbal extract was well-incorporated into the base, ensuring uniform delivery of active ingredients.

6. Stability Study:

Stability testing was conducted under three conditions: room temperature (25°C), refrigeration (4°C), and high temperature (40°C). Over a 4-week period, there were no significant changes in colour, odour, consistency, or pH in any of the conditions. This indicates that the cream is physically and chemically stable over time.

7. **Skin Irritation Test:**

A patch test was conducted on 10 healthy volunteers by applying a small amount of cream to the forearm. The site was observed after 24 hours. No signs of redness, itching, or irritation were recorded, suggesting that the cream is safe for topical use.

8. Efficacy Evaluation:

Ten volunteers with mild to moderate skin tanning applied the cream daily for 2 weeks. Visual assessment and user feedback indicated that 7 out of 10 subjects (70%) experienced noticeable reduction in tanning and improvement in skin texture. The remaining subjects showed mild to moderate effects, with no adverse reactions reported.

CONCLUSION

The present study aimed to develop a safe, effective, and affordable herbal cream using nutmeg (Myristica fragrans) for the removal of tanning caused by sun exposure. The formulation was designed using a combination of natural and skin-beneficial ingredients, including aloe vera, rose water, lemon juice, coconut oil, beeswax, and vitamin E oil. These ingredients were carefully selected based on their historical use in herbal medicine, scientific relevance, and compatibility with the skin. The cream was successfully prepared using the fusion method, which provided a smooth, stable, and uniform product. The nutmeg extract, obtained through ethanol extraction, was rich in essential oils and phenolic compounds known for their antioxidant, antibacterial, and skin- brightening properties. Incorporating it into a topical cream allowed localized delivery and visible effects on sun-damaged skin. Evaluation of the prepared cream showed promising results. Physicochemical parameters such as color, texture, odor, pH, spreadability, viscosity, and homogeneity were found to be satisfactory. The pH of the cream was compatible with the skin's natural pH, ensuring safety and minimal risk of irritation. The spreadability and viscosity were ideal for cosmetic use, making it convenient and pleasant for users to apply. The stability study revealed that the cream retained its consistency, fragrance, and pH over time and under different storage conditions. No microbial growth or phase separation was observed during the test period, which confirmed the formulation's shelf- life potential. Skin irritation studies conducted through patch tests on volunteers showed no signs of adverse reactions, indicating that the cream is non-irritant and safe for human use. The effectiveness of the cream was further supported by a short-term user trial, where most of the participants observed visible improvement in skin tone and reduction in tanning after two weeks of regular application. In conclusion, the herbal nutmeg cream developed through this project proves to be a successful formulation with significant potential in the field of natural cosmetic products.

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