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FORMULATION AND EVALUATION OF A GEL-BASED HERBAL FACE SCRUB FOR SKIN WELLNESS

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ABSTRACT :

The development of innovative cosmetic products leveraging natural ingredients has gained significant attention due to growing consumer demand for safer, eco-friendly, and multifunctional solutions. This study focuses on formulating and evaluating a gel-based herbal face scrub, integrating the beneficial properties of selected herbal ingredients to enhance skin health. The primary objective is to create an effective exfoliating scrub with antioxidant properties while maintaining skin hydration, radiance, and barrier integrity.

Key ingredients such as banana peel, rose oil, turmeric, rice powder and sandalwood are utilized for their synergistic effects, targeting oxidative stress, exfoliation, and antimicrobial activity. Neem and turmeric contribute antibacterial, anti-inflammatory, and antioxidant properties, while coffee powder provide hydration, exfoliation, and a rejuvenating effect. Sandalwood powder is valued for skin healing properties. The formulation involves blending these ingredients into a gel base designed for ease of application, effective exfoliation, and minimal irritation.

The study underscores the advantages of integrating natural antioxidants into cosmetic formulations, addressing modern skincare concerns such as pollution-induced damage, dryness, and ageing. The findings affirm the suitability of herbal formulations as a sustainable alternative to synthetic skincare products, supporting the growing shift toward natural, science-backed cosmetics. This work contributes to the expanding field of herbal dermatology by presenting a scientifically validated product that aligns with consumer preferences and environmental considerations.

Key-words: Antioxidant properties, Antibacterial, Anti-inflammatory

Introduction :

The skin, as the largest and most exposed organ of the body, is continuously subjected to environmental stressors, including UV radiation, air pollution, and other pro-oxidants. These factors contribute to oxidative damage, premature ageing, and skin health deterioration. As a result, there is a growing interest in cosmetic formulations that incorporate natural ingredients known for their antioxidant, antimicrobial, and skin-nourishing properties. This trend is driven by the increasing consumer preference for safer, eco-friendly, and non-toxic alternatives to conventional synthetic products [1].

Herbal formulations have been used for centuries in skincare due to their therapeutic benefits. Ingredients such as banana peel, neem, turmeric, rice powder, coffee powder, and sandalwood powder, rose oil, are well-known for their diverse bioactive properties. Banana peel is rich in minerals. Rice powder is having an ability to maintain skin elasticity. Multani mittihelps cleanses and purifies skin. Neem is rich in antibacterial and anti-inflammatory compounds, making it effective in treating acne and soothing irritated skin [2]. Turmeric has powerful antioxidant and anti-inflammatory properties that protect the skin from free radical damage and improve its radiance [3]. Coffee contains natural exfoliating agents and antioxidants that help remove dead skin cells and promote skin rejuvenation [5]. Sandalwood powder is valued for its skin-calming, anti-inflammatory, and soothing effects [6]. Rose oil is multipurpose essential oil.

The concept of exfoliation, a critical step in skincare, involves the removal of dead skin cells from the epidermis, promoting cellular turnover and enhancing the skin's natural radiance. Herbal scrubs are particularly effective due to their inclusion of natural exfoliating agents that minimize irritation while maintaining skin health [7]. Moreover, the antioxidant properties of these formulations help neutralize free radicals, which are major contributors to skin damage caused by environmental factors [8].

Objectives :

The primary objectives of this study are as follows:

- To provide gentle yet deep Exfoliation, delivering hydration, antioxidant protection, oil control and improvement in skin texture.
- To leverage unique properties of natural ingredients that offers a multifaceted approaches to the skincare.
- To explore the various aspects of the rich traditional Indian herbal medicine.
- To get rid of the problem of all skin types while also providing the skin with much needed nourishment

Ideal Properties of a Herbal Scrub

To ensure the effectiveness and consumer acceptance of a herbal face scrub, the following ideal properties should be met:

1. **Exfoliating Efficacy**
   The scrub should effectively remove dead skin cells, blackheads, and impurities from the skin's surface without causing irritation or abrasions.
2. **Antioxidant Activity**
   It should neutralize free radicals and protect the skin from oxidative stress, thereby reducing signs of ageing such as wrinkles and fine lines.
3. **Skin Nourishment**
   The scrub should provide essential nutrients, such as vitamins and antioxidants, to enhance skin health and radiance.
4. **Moisturizing Properties**
   It should help retain skin moisture, preventing dryness and maintaining hydration after exfoliation.
5. **pH Compatibility**
   The scrub should have a pH close to the skin's natural range (approximately 5.5) to avoid disrupting the skin's protective barrier.
6. **Spreadability**
   The formulation should spread easily over the skin, ensuring uniform application without requiring excessive effort.
7. **Washability**
   The scrub should be easy to rinse off, leaving no residue on the skin.
8. **Eco-Friendly and Sustainable**
   It should be free from synthetic chemicals, microplastics, and harmful preservatives, aligning with sustainable and environmentally friendly cosmetic practices.
9. **Stability**
   The product should remain stable in terms of texture, fragrance, and efficacy over its shelf life under standard storage conditions.

Materials :

1. **Banana Peels**
   Family: Musaceae
   Part Used: Peel
   Banana peels, typically regarded as waste, are rich in essential minerals and vitamins that enhance skin beauty. Their high potassium content plays a crucial role in regulating hydration and maintaining skin elasticity, making them a valuable addition to skincare products.

2. **Rice Powder**
   Family: Poaceae
   Part Used: Grain
   Rice powder is a natural ingredient rich in nutrients, known for its ability to maintain skin elasticity and minimize signs of ageing. It exfoliates gently, leaving the skin smooth and radiant

3. **Multani Mitti (Fuller's Earth)**
   Family: N/A (Natural clay, not plant-derived)
   Part Used: Mineral-rich clay
   Multani Mitti is a natural clay celebrated for its rich mineral composition. Widely used in skincare, it absorbs excess oil, cleanses impurities, and tightens the skin, making it an excellent choice for face scrubs.

4. **Coffee Powder**
   Family: Rubiaceae
   Part Used: Beans
   Coffee powder, with its invigorating aroma and high mineral content, serves as a dynamic skincare ingredient. It gently exfoliates, enhances circulation, and improves skin texture, making it ideal for reducing puffiness and promoting a healthy glow.

5. **Neem (Azadirachta indica)**
   Family: Meliaceae
   Part Used: Leaves
   Neem, a cornerstone in Ayurvedic medicine, is renowned for its antibacterial and anti-inflammatory properties. It is highly effective in treating acne, reducing skin infections, and soothing irritation, making it a key ingredient in face scrubs for acne-prone skin.

6. **Sandalwood Powder (Santalum album)**
   Family: Santalaceae
   Part Used: Heartwood
   Sandalwood powder is valued for its antimicrobial and skin-healing properties. Its soothing nature helps calm irritated skin, while its anti-inflammatory benefits make it suitable for sensitive skin.

7. **Turmeric (Curcuma longa)**
   Family: Zingiberaceae
   Part Used: Rhizome
   Turmeric, with its potent antioxidant and anti-inflammatory properties, combats free radicals and enhances skin radiance. It addresses fine lines and wrinkles, making it a staple ingredient for anti-ageing skincare.

8. **Rose Oil (Rosa damascena)**
   Family: Rosaceae
   Part Used: Flowers
   Rose oil is a natural essential oil known for its anti-inflammatory and antibacterial properties. It soothes irritation, reduces redness, and maintains moisture balance while promoting skin regeneration and a radiant complexion.

9. **Triethanolamine**
   Triethanolamine acts as a surfactant and stabilizer, improving product consistency and quality.
10. **Propylene Glycol**
    Propylene glycol serves as a moisturizer and humectant. It enhances skin smoothness and hydration, addressing dryness and flakiness effectively.
11. **Methylparaben**
    Methylparaben is a preservative that extends the product's shelf life, preventing microbial growth.
12. **Sodium Lauryl Sulfate**
    Sodium lauryl sulfate is a surfactant used for its cleansing and foaming properties, enhancing product texture and efficacy.
13. **Carbopol**
    Carbopol functions as an emulsifying, stabilizing, thickening, and gelling agent. Its versatility ensures a smooth and consistent texture for the scrub.
14. **Distilled Water**
    Distilled water serves as a vehicle for the formulation, ensuring a uniform mix of all components and maintaining product stability.

Sr.no	Ingredients	Quantity (for 50 ml)	Uses
I	Banana peel	5 gm	Antiaging, Antioxidant
2	Coffee powder	1 gm	Exfoliating agent, scrubbing agent
3	Rice powder	1.5 gm	Improves complexion
4	Sandalwood powder	1 gm	Anti-inflammatory
5	Multani soil	0.5 gm	Skin whitening
6	Neem	2 gm	Skin conditioner, Antiseptic
7	Turmeric	0.25 gm	Antiseptic, Improves fairness
8	Carbopol	I gm	Gelling agent
9	Triethanolamine	I ml	Neutralizer
10	Propylene glycol	1 ml	Moisturizer
11	Methylparaben	0.05 gm	Preservative
12	Sodium lauryl sulphate	2 gm	Foaming agent
13	Rose oil	4-5 drops	Perfuming agent
14	Distilled water	Qs to 50 ml	Vehicle

Method: Process

1. **Extraction through the cold maceration process**:
   Soak the banana peels, neem leaves, turmeric, in distilled water for 24–48 hours at room temperature to extract their bioactive compounds.

2. **Filtration**:
   After maceration, filter the mixture to separate the plant material from the liquid extract, obtaining the concentrated herbal extracts for use.

3. **Evaporation**:
   Evaporate the solvent from the liquid extract under controlled conditions to concentrate the active ingredients and remove excess moisture.

4. **Preparation of Gel**:
   Mix carbopol with distilled water to form a gel base. Adjust the pH to a skin-friendly level using triethanolamine for proper consistency.

5. **Formulation of Scrub**:
   Blend the concentrated herbal extracts, coffee powder, sandalwood powder, rice powder, Multani mitti, rose oil, and other ingredients like propylene glycol and methylparaben into the gel base. Mix thoroughly to ensure uniform consistency and texture. Add sodium lauryl sulfate to enhance cleansing properties and ensure the scrub has an optimal foaming action.
6. **Packaging**:
   Store the final scrub in airtight containers to maintain its stability, preventing contamination and ensuring long shelf life.

Evaluation of the Polyherbal Antioxidant Face Scrub :

1. **Appearance**
   The prepared scrub gel was evaluated for its **odor** and **colour**. It exhibited a pleasant fragrance and a uniform colour, enhancing its aesthetic appeal.
2. **pH**
   The pH of the prepared scrub was assessed by applying a small amount to pH paper. The pH value was found to be suitable for skin application, close to the natural skin pH (~5.5), ensuring compatibility and safety.
3. **Consistency**
   Visual observation revealed that the scrub had a semi-solid consistency, making it easy to apply and spread over the skin.
4. **Extrudability**
   A small amount of the scrub was placed in a collapsible ointment tube. One end was sealed, and the other end was kept open. Upon applying slight pressure to the sealed side, the time taken for extrusion and the quantity extruded were measured. The scrub demonstrated satisfactory extrudability, ensuring ease of use.
5. **Viscosity**
   The scrub's viscosity was measured using a Brookfield viscometer. The results indicated optimal viscosity, suitable for maintaining stability and facilitating smooth application.
6. **Irritability**
   A small amount of scrub was applied to the skin and left for a few minutes. No signs of irritation, redness, or discomfort were observed, confirming that the formulation was non-irritant and safe for use.
7. **Washability**
   The washability was tested by applying a small amount of scrub on the skin and rinsing it with water. The formulation was easily removed, leaving no residue and ensuring user convenience.
8. **Grittiness**
   The scrub was checked for the presence of gritty particles by applying it to the skin. It exhibited fine granules that provided gentle exfoliation without causing abrasions.
9. **Foamability**
   The foamability was tested by shaking a small amount of scrub with water in a graduated cylinder. The initial and final foam volumes were recorded after 10 shakes. The scrub produced a moderate and stable foam, enhancing its cleansing action.
10. **Patch Test**
    Patch testing was performed to evaluate hypersensitivity and allergic potential. A small area of skin was exposed to the formulation in a dilute form. The reaction was monitored for 2–3 days, and no adverse effects such as redness, swelling, or irritation were observed, confirming its safety.
11. **Stability Study**
    The stability of the scrub was tested by storing it in plastic containers placed in a humidity chamber at 45°C with 75% relative humidity. Observations were made over three months at one-month intervals. The formulation remained stable in terms of colour, texture, and efficacy, ensuring its shelf-life and usability.

Conclusion :

In conclusion, the formulated herbal face scrub exhibited acceptable characteristics such as color, odour, consistency, pH, washability, foamability, viscosity, extrudability, spreadability, and stability. Stability studies indicated that the formulation remained acceptable under different conditions, showcasing its potential for production and use. The inclusion of natural ingredients like banana peel, known for its antibacterial and anti-aging properties, along with other herbal components, contributes to the formulation's potential skin-enhancing benefits. The scrub aims to provide various advantages, including the removal of dead skin cells, unclogging pores, reducing acne scars, and promoting smoother and healthier skin.

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