

Comparative study of *Dragon Fruit* pulp and peel extract in herbal cleanser formulation

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Abstract

The increasing consumer demand for natural and eco-friendly skincare products has encouraged the use of plant-based and fruit-waste-derived ingredients in cosmetic formulations. In the present study, a herbal exfoliating scrub was formulated and evaluated using dragon fruit peel extract in combination with aloe vera, neem, tulsi, Multani mitti, cinnamon oil, and rose water. Dragon fruit peel extract was selected due to its rich antioxidant content and natural exfoliating properties, while the other herbal ingredients contributed moisturizing, soothing, and antibacterial effects to the formulation. The prepared gel-based scrub was evaluated for various physicochemical parameters such as pH, appearance, spreadability, and stability under different storage conditions. Sensory evaluation was also carried out with volunteers to assess characteristics including texture, ease of application, skin irritation, and overall user acceptability. The findings indicated that the formulation was stable, skin-friendly, and suitable for topical application. The study highlights the potential of dragon fruit peel extract as an effective natural exfoliating agent and demonstrates the value of utilizing fruit waste in cosmetic applications. The presence of natural antioxidants and moisturizing compounds in dragon fruit peel contributes to improved skin hydration, softness, and elasticity. Additionally, its anti-inflammatory properties help soothe irritated skin and reduce redness, while its antibacterial activity may assist in controlling acne-causing microorganisms. Therefore, the developed herbal scrub can be considered a promising, sustainable, and eco-friendly alternative to synthetic exfoliating products used in skincare formulations.

Keywords: Dragon Fruit Peel; Cleansing; Hydrate; Honey Cleanser; Facial Cleanser; Natural Fruit Enzymes

1. Introduction

Dragon fruit face cleanser is a skincare product formulated using extracts of dragon fruit (pitaya), a tropical fruit known for its rich content of vitamins, antioxidants, and natural moisturizing compounds. Due to the increasing consumer preference for safe, herbal, and environmentally friendly skincare products, the cosmetic industry has recently focused more on the use of natural ingredients in skincare formulations. Dragon fruit contains vitamin C, antioxidants, and essential nutrients that help cleanse the skin, remove impurities, reduce dullness, and maintain skin hydration. Its antioxidant properties may also protect the skin from environmental damage caused by pollution and ultraviolet radiation, making it a suitable ingredient for daily skincare products such as face cleansers. Dragon fruit face cleansers are commonly used to remove dirt, excess oil, dead skin cells, and makeup while leaving the skin feeling refreshed, soft, and smooth. To enhance cleansing efficiency and provide additional skin benefits, dragon fruit extract is often combined with other beneficial ingredients such as aloe vera, glycerin, and niacinamide. The growing popularity of fruit-based and herbal cosmetics has increased interest in dragon fruit cleansers because of their natural origin and skin-friendly properties. Therefore, this research focuses on the formulation, evaluation, benefits, and commercial potential of a dragon fruit-based face cleanser in modern skincare applications. The present study aims to formulate and evaluate a face serum cleanser using peel extract of *Hylocereus undatus* with antioxidant, anti-aging, and skin-rejuvenating properties. Another important objective of the study is to utilize fruit waste effectively in the development of sustainable

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and herbal-based cosmetic products. Various evaluation parameters, including pH, viscosity, spreadability, and stability, will be assessed to determine the quality, performance, and shelf life of the formulation. The developed product is expected to provide an effective, eco-friendly, and safer alternative to synthetic cosmetic cleansers while meeting the increasing consumer demand for natural skincare products.

1.1. Plant Profile

The purpose of this project is to develop eco-friendly, herbal-based cosmetic products by utilizing fruit waste as a natural ingredient source. The study aims to evaluate the formulation for various parameters such as pH, viscosity, spreadability, and stability in order to determine its quality, effectiveness, and shelf life. The developed formulation is expected to serve as a safe, natural, and environmentally sustainable alternative to synthetic cosmetic products while fulfilling the growing consumer demand for herbal and chemical-free skincare products.



Figure 1 *Selenicereus Undatus* Plant



Figure 2 Dragon Fruit

Table 1 Botanical Classification of Dragon Fruit

Synonym	Pitaya, pitahaya, white pitaya.
Biological source	Dragon fruit is derived from the plants of the genus of Hylocerus & Selenicereus species.
Kingdom	Plantae
Order	Caryophyllales
Family	Cactaceae (Cactus family)
Sub- Family	Cactoideae
Botanical name	Selenicereus or Hylocerus udantus
Genus	Hylocerus or Selenicereus spp.

1.2. Chemical Constituents And Uses:

Natural sugars, minerals, fatty acids, organic acids, vitamin C, polyphenols, flavonoids, betacyanins, and antioxidants. Dragon fruit is useful for skincare products like face cleansers since these ingredients include antioxidant, moisturizing, brightening, and skin-protective qualities.

1. Antioxidant Activity: Helps prevent oxidative stress on the skin and neutralize free radicals.

2. Anti-aging Effects: By promoting the creation of collagen, wrinkles and fine lines are less noticeable.

3. Skin Brightening: Vitamin C and betalains improve the skin's brightness and tone.

4. Anti-inflammatory Properties: Beneficial for skin prone to acne, these properties soothe irritated or inflamed skin.

5. Hydration and Miniaturization: Prevents dryness and keeps skin moisturized.

6. Wound Healing and Skin Regeneration: Using bioactive substances, it promotes skin regeneration and repair.

7. Protection Against UV Damage: Reduces photoaging and UV-induced skin damage.

1.3. Benefits for Skin

1.3.1. Cleansing

Dragon fruit face cleanser helps remove dirt, impurities, pollutants, sweat, and excess oil from the surface of the skin. Its gentle cleansing action makes it suitable for daily use, as it effectively cleans the pores without causing excessive dryness or irritation to the skin.

1.3.2. Brightening

Dragon fruit is rich in vitamin C and antioxidants, which help brighten the skin and improve its natural glow. Regular use of a dragon fruit cleanser may promote a more radiant, fresh, and even-toned appearance of the skin.

1.3.3. Hydration

Dragon fruit has a high water content and natural moisturizing properties that help maintain skin hydration. It helps prevent dryness and leaves the skin feeling soft, smooth, and refreshed after cleansing.

1.3.4. Anti-Aging

The antioxidants present in dragon fruit help fight free radicals that contribute to premature skin aging. These properties may help reduce the appearance of fine lines, wrinkles, and signs of tiredness, while promoting healthier and more youthful-looking skin.

1.3.5. Acne Control

Dragon fruit possesses mild antibacterial and anti-inflammatory properties that may help reduce skin irritation and control acne-causing bacteria. By removing excess oil and impurities, the cleanser helps keep pores clean and may reduce the occurrence of acne breakouts.

1.3.6. Exfoliation

The natural enzymes in dragon fruit, along with its mild exfoliating properties, help remove dead skin cells from the surface of the skin. This supports healthy skin renewal, improves skin freshness, and promotes a smoother skin texture.

2. Methodology

2.1. Gathering and Preparing Dragon Fruit Peel

Fresh dragon fruit peels were collected from a local market and thoroughly washed with distilled water to remove dirt and impurities. The cleaned peels were then cut into small pieces and dried in a hot air oven at 40–50°C for 24–48 hours. After drying, the peels were ground into a fine powder using a blender and stored in an airtight container for further use.

2.2. Dragon Fruit Peel Extraction

Using the maceration method, approximately 100 g of dragon fruit peel powder was soaked in 500 mL of 95% ethanol and kept at room temperature for 72 hours with occasional stirring. After maceration, the mixture was filtered using filter paper to remove the solid residue. The obtained filtrate was then concentrated using a water bath at 50°C, resulting in a semisolid extract.

Table 2 Ingredients

Sr.No	Ingredients	Role	Quantity
1	Dragon fruit extract	Nourishing, antioxidant	30ml
2	Aloe vera gel	Moisturizer, soothing agent	20ml
3	Neem extract	Antibacterial	10ml
4	Tulsi extract	Anti-inflammatory	10ml
5	Rose Water	Toner, fragrance	15ml

6	Multani mitti	Cleansing, oil control	10 g
7	Honey	pH adjustment	3ml
8	Preservative Cinnamon oil	Antimicrobial properties, Antifungal activity	2-3 drops

2.3. Procedure for Preparation

- **Step 1: Prepare Dragon Fruit Extract**
- Take fresh dragon fruit pulp.
- Blend it properly.
- Filter using muslin cloth or filter paper.
- Collect clear extract.
- **Step 2: Prepare Herbal Extracts**
- Neem and tulsi extracts should already be filtered and free from particles.
- Keep all ingredients ready in clean containers.
- **Step 3: Prepare Base**
- Take a clean beaker or bowl.
- Add: Aloe vera gel, Rose water, Honey
- Stir continuously until smooth.
- **Step 4: Add Active Ingredients**
- Add dragon fruit extract slowly while stirring.
- Add neem extract.
- Add tulsi extract.
- Mix uniformly.
- **Step 5: Add Multani Mitti**
- Add multani mitti little by little.
- Stir continuously to avoid lumps.
- Mix until smooth semi-liquid consistency forms.
- **Step 6: Add Preservative**
- Add 2-3 drops cinnamon oil.
- Mix thoroughly.
- **Step 7: Packaging**
- Transfer cleanser into a clean airtight bottle or container.
- Store in cool place refrigerator



Figure 3 Herbal Plants



Figure 4 Herbal Extract

2.4. PH Determination

The pH of the facial cleanser was measured using a digital pH meter. Ideal skin pH: pH=5.5 to 6.5



Figure 5 PH Deterination

2.5. Foamability Test

A small quantity of cleanser was mixed with water and shaken vigorously in a measuring cylinder. Foam height was measured after 1 minute.



Figure 6 Foamability test

2.6. Viscosity Test

The viscosity of the formulation was determined using a Brookfield viscometer at room temperature.



Figure 7 Viscosity test

2.7. Spreadability Test

Spreadability was evaluated by placing the gel between two glass slides and measuring the spreading diameter.

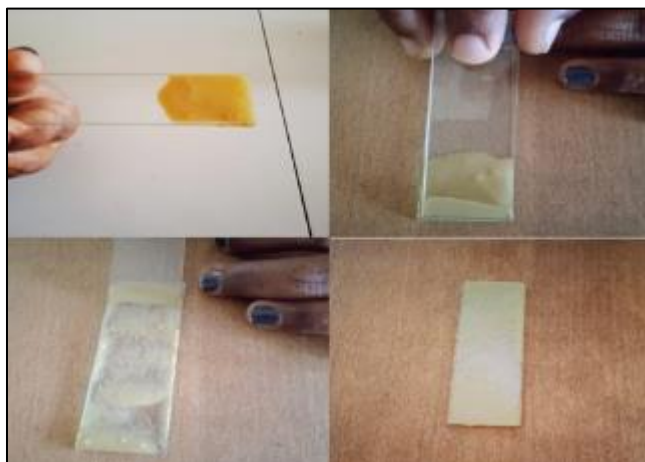


Figure 8 Spreadability test

2.8. Stability Study

The formulation was stored at:

- Room temperature
- Refrigerated condition
- Elevated temperature (40°C)
- Directions For Use
- Apply small amount on wet face.
- Massage gently for 1-2 minutes.
- Wash with normal water.
- Use 1-2 times daily.

2.9. Benefits of This Cleanser

- 1.Deep cleansing
- 2.Removes excess oil
- 3.Antioxidant prote
- 4.Soothes skin irritation



Figure 9 Dragon fruit cleanser

2.9.1. How Dragon Fruit Face Cleanser Works

- Removes dirt and oil: The cleanser contains mild surfactants that bind with oil, sweat, and dirt on the skin. When rinsed with water, these impurities are easily removed, leaving the skin clean without causing excessive dryness.
- Protects the skin barrier: Dragon fruit is rich in vitamins, amino acids, and natural moisturizing compounds that help maintain the skin's protective barrier. This ensures gentle cleansing without stripping away essential natural oils that keep the skin healthy.
- Antioxidant action: Dragon fruit contains antioxidants such as vitamin C and betalains, which help neutralize free radicals. Since free radicals can contribute to dullness, premature aging, and skin damage, these antioxidants support healthier and more even-toned skin.
- Skin-refreshing effect: After cleansing, the skin feels cool, hydrated, and refreshed due to the natural water content and soothing properties of dragon fruit. This helps reduce the appearance of tired and dull skin, leaving it revitalized.

3. Conclusion

In conclusion, dragon fruit face cleanser is an effective skincare product that cleans the skin while maintaining its natural hydration and softness. Its gentle formulation makes it suitable for daily use, as it helps preserve the skin's natural balance without causing dryness or irritation. Regular use of this cleanser can improve overall skin freshness and appearance. The cleanser works by removing dirt, excess oil, and impurities while also delivering essential nutrients to the skin. The antioxidants present in dragon fruit help protect the skin from environmental damage and support overall skin health. Over time, its regular use may contribute to clearer, smoother, and more radiant-looking skin. Overall, dragon fruit face cleanser is a natural and beneficial skincare product designed to cleanse, nourish, and protect the skin. It helps maintain the skin's moisture barrier while improving texture and defending against external damage with the help of vitamins and antioxidants.

4. Result

The results indicate that the dragon fruit face cleanser effectively removes environmental pollutants, excess sebum, and dirt from the skin surface. The presence of natural antioxidants and bioactive compounds helps reduce oxidative stress and supports the skin's protective barrier function. Regular use of the formulation showed noticeable improvements in skin hydration, texture, and overall appearance, resulting in a healthier and more refreshed skin condition. The study also found that the cleanser efficiently removes impurities, excess oil, and surface contaminants while providing mild antioxidant protection against environmental damage. With consistent application, users experienced improved skin smoothness, better hydration, and a more revitalized appearance.

Compliance with ethical standards

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