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FORMULATION OF SOAP USING ORYZA SATIVA

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Abstract

An imbalance between antioxidants and free radicals in the body can lead to oxidative stress, triggering various degenerative diseases. One preventive measure is maintaining skin health through proper cleansing. However, commercial synthetic soaps, often used for skin whitening, contain harsh chemicals, artificial fragrances, and colors that may strip the skin's natural oils, disrupt its pH balance, and cause allergic reactions or infections over time. To address these issues, a natural soap was developed using rice water, known for detoxifying and nourishing skin with vitamins. The soap is made from easily available natural ingredients such as rice milk, shea butter, almond oil, lavender, potato, soap base, coconut oil, and cocoa butter. Herbal soaps, like this rice-based variant, are rich in antioxidants and offer benefits such as moisturizing, brightening, exfoliating, anti-aging properties, and fewer side effects. They are also environmentally friendly and cruelty-free. The soap was evaluated through tests on skin irritation, foam retention, moisture content, and pH levels. The study concludes that the demand for natural and herbal soaps is increasing due to their effectiveness and safety compared to synthetic alternatives, with consumers preferring herbal options for their skin-friendly and eco-conscious benefits.

Introduction of Anatomy and Physiology of Skin

Skin is the most exposed part of the body to the sunlight, environmental pollution and also used for protection against the pathogen. The skin is the largest organ of the human body, forming a continuous covering or integument over the external surface. It serves as the first line of defence against physical, chemical, and biological insults, including ultraviolet (UV) radiation, pathogens, and toxic chemicals [1]. Structurally, it consists of the epidermis, dermis, and hypodermis, each contributing to barrier function, thermoregulation, and sensory perception [2]. The skin also regulates transepidermal water loss, assists in maintaining internal temperature through vasodilation and vasoconstriction, and provides immunological surveillance [3]. Due to its exposure, it is highly susceptible to environmental stressors such as sunlight, air pollutants, and microbial contamination [4].

Soap is a salt of fatty acid (sometimes other carboxylic acids) used as cleansing agent designed for cleaning body it's typically made from a combination of fats or oils and an alkali, and it dissolves in water to create a lather that helps remove dirt and impurities from the skin. Bath soaps can be found in various forms (bar, liquid, etc.,). Bath soaps are available in various forms bar, liquid, or gel and may include additives such as moisturizers, fragrances, or antibacterial agents to enhance cleansing and skin benefits [5]. Toilet soaps with higher total fatty matter (TFM) content generally offer better cleansing and skin conditioning properties compared to low-TFM formulations [6].

Oryza sativa, commonly known as Asian rice, is a grass species and a globally significant cereal crop, serving as a staple food for over half the world's population. Oryza sativa (Asian rice) is a globally important cereal crop, serving as a staple food for over half of the world's population and contributing to nutritional security, particularly in developing countries [7]. Rice water, the starchy by-product obtained. Rice water, the starchy liquid

obtained after soaking or boiling rice, is a traditional beauty remedy gaining popularity for its potential benefits for both hair and skin. Rice water contains vitamins and antioxidants, including ferulic acid and γ-oryzanol, that can help improve skin texture and brighten the complexion by reducing the appearance of dark spots and hyperpigmentation [8]. Its anti-inflammatory properties may help soothe irritated skin and reduce redness associated with conditions like acne or sunburn9.Rice soap is a skincare product, typically made from rice water, known for its gentle and potentially beneficial properties for the skin. It is often used for skin brightening, moisturizing, and soothing, and is particularly popular in Asian beauty traditions.

Ideal Characteristics of Soap

Cleansing: A good soap effectively removes dirt, oil, and impurities from the skin without stripping away its natural oils.

Lather: A balanced lather, both bubbly and creamy, enhances the cleansing experience.

Mildness: Soap should be gentle on the skin, avoiding irritation or dryness.

Moisturizing: Ideal soap helps to prevent water evaporation from the skin, contributing to hydration.

Hardness: A harder soap bar tends to last longer, providing better value.

Fragrance: A pleasant fragrance can improve the user experience, masking body odours and potentially evoking positive emotions.

Skin Compatibility: The soap's pH should be close to the skin's natural pH (around 5.5) to maintain the skin's protective barrier.

Biodegradability: A biodegradable soap is environmentally friendly.

Antimicrobial Properties: Some soap may contain antimicrobial agents to help reduce the risk of infection.

Balanced Fatty Acid Content: Different fatty acids contribute to various soap properties like lather, hardness, and conditioning. For instance, coconut oil can create a bubbly lather, while olive oil contributes to a milder, moisturizing soap.

Super fatting: Adding extra fat (super fatting) can enhance the soap's moisturizing properties.

Fragrance Preservation

Microencapsulation can help preserve fragrance and prevent its loss due to environmental factors.

Benefits of Herbal Soap

1. Nourishing: Herbal soaps contain the goodness of nature, and this makes them nourishing for skin. Its offers comfort, healing and stress relief as well.

2. Therapeutic: Therapeutic because of properties such as relief from tension and the healing power of herbal soaps.

3. Tanning: UVA radiation is what makes people tan. UVA rays penetrate to the lower layers of the epidermis, where they trigger cells called melanocytes to produce melanin, herbal soap thus are beneficial without being harsh.

4. Exfoliation: Some herbal soaps can help fade stretch marks, hyper pigmentations, and dark spots by exfoliating and removing dead skin cells.

5. Environmentally Friendly: Often produced using sustainable and eco-friendly practices. They are typically biodegradable and do not contribute to water pollution like some conventional soap.

Advantages of Herbal Soap

1. Natural ingredients – Herbal soap are typically made from natural plant based ingredients such as herbs, essential oils, and botanical extract. These natural ingredients are often gentle on the skin and may help to soothe and nourish the skin without causing irritation and dryness.

2. Hypoallergenic – Herbal soap are often hypoallergenic, meaning they are less likely to cause allergic reaction compared to synthetic soaps that may contain harsh chemicals and artificial fragrances.

3. Aromatherapy Benefits – Much herbal soap contain essential oils, which can provide aromatherapy benefits, help to relax the mind, uplift the mood and provide a sense of well-being during the bathing process.

4. Variety – There are many different types of soaps available, catering to various skin types and preferences.

5. Accessibility – Soap is widely available and relatively affordable, making it accessible to a large population [1].

Benefits of Rice Soap

Rice soap offers several benefits for the skin, including brightening, evening skin tone, and moisturizing. It can also help lighten scars and dark spots, and its gentle nature makes it suitable for sensitive skin.

Brightening and Even Skin Tone

Rice soap, often containing rice flour or rice milk, is known for its potential to brighten the skin and improve its overall tone, reducing the appearance of dark spots and hyper pigmentation.

Gentle Cleansing

Rice-based soaps are generally mild and gentle, making them suitable for sensitive skin types that may react negatively to harsher cleansers.

Moisturizing

The ingredients in rice soap can help to hydrate the skin, leaving it feeling soft, supple, and moisturized.

Antioxidant Properties

Rice contains antioxidants that can help protect the skin from damage caused by free radicals and environmental stressors. Regular use of rice soap may help to lighten scars and other dark spots on the face, contributing to a more even complexion.

Materials and Methods

Materials

Rice water, potato, coca butter, Glycerine soap base, lavender oil, vitamin E capsule.

Rice Water: Rice water, the leftover liquid from rinsing or cooking rice, is used in soap making to add beneficial properties like gentle exfoliation, hydration, and antioxidant protection. It's incorporated into the soap's liquid component, replacing some or all of the water, and contributes to a soothing and potentially brightening effect, especially in cold process soap.

Potato: Potato (Solanum tuberosum L.) is valued in skincare formulations, including herbal soaps, for its bioactive compounds such as vitamin C, phenolic acids, and flavonoids, which contribute to antioxidant and anti-inflammatory properties [10]. These compounds may assist in reducing hyperpigmentation, lightening dark spots, and providing mild bleaching effects through inhibition of melanin synthesis [11]. The presence of ascorbic acid also supports collagen synthesis and skin brightening, while its anti-inflammatory activity can help soothe irritation and redness [12].

Coca Butter: Cocoa butter (Theobroma cacao L.) is a natural fat extracted from cocoa beans, rich in stearic, palmitic, and oleic acids, which provide emollient and moisturizing properties in skincare formulations13. Its lipid composition helps to reinforce the skin barrier, reduce transepidermal water loss (TEWL), and improve skin elasticity. Cocoa butter also contains minor bioactive compounds such as tocopherols and polyphenols, which contribute antioxidant activity, potentially reducing oxidative stress in the skin [14].

Glycerin Soap base: Glycerin is a trihydroxy alcohol widely used in cosmetic formulations for its humectant properties, drawing water into the stratum corneum to improve skin hydration [15]. In soap bases, glycerin not only retains moisture but also enhances transparency and mildness, making it suitable for sensitive skin. Glycerin-containing cleansers have been shown to maintain skin barrier function better than conventional soaps, reducing dryness and irritation. Glycerin soap base is a popular choice for making rice soap due to its moisturizing properties and ability to create a clear, appealing base. It acts as a humectant, attracting moisture to the skin and preventing it from drying out, making it suitable for various skin types. When combined with rice milk, it can enhance the soap's moisturizing and skin-brightening benefits.

Lavender Oil: lavender calms and refreshes the senses. Perfect for daily use on both face and body, it cleanses deeply without drying. Suitable for all skin types. Lavender oil acts as a fragrant and therapeutic additive in rice soap. Lavender (Lavandula angustifolia Mill.) essential oil is used in skincare for its fragrance and bioactive properties, including antimicrobial, anti-inflammatory, and antioxidant effects [16]. The main constituents, linalool and linalyl acetate, contribute to its therapeutic benefits, which may aid in soothing skin irritation and promoting wound healing [17]. Lavender oil has also been studied for its role in reducing skin redness and improving comfort in topical formulations [18].

Vitamin E Capsule: Vitamin E is a powerful antioxidant that can help protect skin from environmental damage and premature aging. primarily for their antioxidant and moisturizing properties. They can help to protect the skin from damage caused by free radicals and can also help to soften and moisturize the skin.Vitamin E (tocopherol) is a lipid-soluble antioxidant used in cosmetic products for its ability to neutralize free radicals and protect skin lipids from oxidative damage [19]. Topical vitamin E has been reported to improve skin hydration, enhance barrier function, and reduce signs of photoaging [20]. Its incorporation in soap formulations provides antioxidant stability and contributes to the protection of skin from environmental stressors [21].

Table 01: Ingredients and Uses of Herbal Rice Soap

Ingredient	Use
Rice Water	Brightens skin, reduces inflammation, and improves skin texture.
Cocoa Butter	Moisturizes and nourishes dry skin; adds smoothness to the soap.
Vitamin E Capsule	Acts as an antioxidant and helps in skin repair and hydration.
Lavender Oil	Provides a calming fragrance and has antibacterial properties.
Sodium Lauryl Sulfoacetate	Creates mild lather and cleanses the skin without irritation.
Potato	Helps lighten skin and reduce dark spots.
Glycerin Soap Base	Hydrates and softens the skin, acts as the base for soap making.

Method

Table 02: Formulation For 100g Herbal Rice Soap

S.No	Ingredient	Quantity (g or ml)
1	Glycerin Soap Base	80 g
2	Rice Water	5 ml
3	Potato Juice	5 ml
4	Cocoa Butter	5 g
5	Lavender Oil	0.5 ml (approx. 10 drops)
6	Vitamin E Capsule	2 capsules (approx. 1 ml)
7	Sodium Lauryl Sulfoacetate	2 g

Step-by-Step Process

Step 1: Preparation of Rice Water

- Soak 1/4 cup of rice in 1 cup of water for 30–45 minutes.

- Stir occasionally, and then strain the water.
- Optionally, boil the water for a few minutes for better concentration and shelf life.

Step 2: Extraction of Potato Juice

- Peel and grate a fresh potato.
- Squeeze out the juice using a muslin cloth or fine strainer.
- Filter to remove anyfiber residues.

Step 3: Melting the Glycerin Soap Base

- Cut the glycerin soap base into small cubes.
- Melt it using the double boiler method or microwave (30-second intervals with stirring).
- Do not overheat to avoid evaporation of active ingredients.

Step 4: Addition of Cocoa Butter

- Once the soap base melts completely, add about 5–10% melted cocoa butter.
- Stir well to ensure uniform mixing.

Step 5: Incorporation of Aqueous Extracts

- Add rice water and potato juice (5–10% total of the formula) slowly into the mixture.
- Stir gently but continuously to avoid clumping or separation.

Step 6: Adding Active and Functional Ingredients

- Add 1–2 vitamin E capsules (as antioxidant)
- A few drops of lavender oil (for fragrance and antibacterial property)
- Sodium lauryl sulfoacetate (1–2%) for mild foaming
- Mix thoroughly and uniformly.

Step 7: Molding and Setting

- Pour the final mixture into soap molds.
- Allow it to cool at room temperature for 4–6 hours (or refrigerate for 1–2 hours).
- Once solidified, demold the soap bars carefully.

Step 8: Curing (Optional)

- Although glycerin soaps do not require long curing, letting them sit for 24–48 hours can help improve hardness and longevity.

Storage

- Store in airtight containers or wrap in cling film to avoid moisture absorption.
- The final formulated herbal rice soap is packed shown in fig no:16,17

Table 03: Evaluation Tests

Test Parameter	Method Used	Result	Remarks
Physical Appearance	Visual inspection	Smooth, cream-white	No cracks, uniform texture
pH (1% solution)	pH meter	6.2	Skin-friendly, slightly acidic
Foam Height	Cylinder shake method	145 mm	Good foaming ability
Total Fatty Matter (TFM)	Titration method	76%	Meetsquality standards
Moisture Content	Gravimetric drying method	12%	Within acceptable limits
Lathering Test	Rubbing method with water	Forms creamy lather	Satisfactory cleansing
Spreadability	Parallel plate method	5.1 g·cm/s	Easily spreadable
Skin Irritation Test	Patch test (on human volunteers)	No irritation reported	Safe for normal skin
Weight Variation	Weighing of multiple units	99.5–100.2 gm	Within ±5% limit
Microbial Load	Plate count agar method	<100 CFU/g	Acceptablefor cosmetic product

Results

The formulated herbal product was subjected to several evaluation parameters to ensure its quality, safety, and effectiveness. On visual inspection, the physical appearance was found to be smooth and cream-white with no cracks and a uniform texture. The pH of a 1% solution measured 6.2, which is skin-friendly and slightly acidic, making it suitable for topical application. The foam height, determined by the cylinder shake method, was 145 mm, indicating good foaming ability. The total fatty matter (TFM) was calculated to be 76% using titration, which complies with standard quality requirements. The moisture content, obtained by gravimetric drying, was 12%, well within acceptable limits.

In terms of performance, the lathering test demonstrated the formation of a creamy and stable lather, confirming satisfactory cleansing properties. The spreadability, determined by the parallel plate method, was 5.1 g•cm/s,indicating easy application. The skin irritation test, performed on human volunteers, reported no irritation, confirming its safety for normal skin. The weight variation of multiple units ranged from 99.5 to 100.2 g, which was within the permissible ±5% range. Finally, the microbial load determined by the plate count agar method was less than 100 CFU/g, which is acceptable for a cosmetic product.

Discussion

The evaluation of the formulated natural rice soap highlights its potential as a safer and more sustainable alternative to conventional synthetic soaps. Synthetic soaps, although widely available, often contain petroleum derivatives, synthetic surfactants, artificial colors, and chemical preservatives that may cause skin dryness, irritation, or allergic reactions upon long-term use. Additionally, their excessive foaming agents and high pH

can strip the skin of natural oils, leading to roughness and imbalance of the skin barrier.

In contrast, the natural rice soap formulated in this study demonstrated favorable properties in terms of pH, spreadability, lathering, and safety. The slightly acidic pH (around 6.2) of rice soap is closer to the natural skin pH, making it gentler and more compatible with human skin. Its composition, enriched with rice water, plant-derived oils, and natural additives, provides moisturizing and antioxidant benefits absent in most synthetic formulations. The presence of vitamins, amino acids, and antioxidants in rice enhances nourishment, promotes skin brightness, and supports barrier repair, which is particularly advantageous for individuals with sensitive or dry skin.

The evaluation parameters further support these claims: the rice soap formed a creamy lather with satisfactory cleansing ability, maintained adequate total fatty matter (76%), and showed no irritation in patch testing, confirming its dermatological safety. Moreover, the microbial load was within acceptable limits, indicating stability and safety for cosmetic use. These findings collectively suggest that natural rice soap not only performs equivalently to synthetic soaps in cleansing efficacy but also offers additional skin benefits without adverse side effects.

Therefore, while synthetic soaps may provide immediate foaming and cleansing at lower cost, their long-term use raises concerns of chemical exposure and environmental impact. The natural rice soap stands out as a more holistic product-mild, eco-friendly, and enriched with bioactive compounds-that aligns with consumer demand for safe, herbal-based skincare solutions.

Conclusion

In contrast to synthetic soaps that may contain harsh chemicals and cause adverse reactions this natural soap aligns with the increasing consumer preference for products that are highly moisturizing, rich in antioxidants, cost-effective, and environmentally friendly. The study concludes that the demand for natural and herbal soaps is efficient and superior to synthetic alternatives, providing a beneficial and less harmful option for skin care. This formulation exemplifies how natural ingredients can be effectively utilized to create a product that supports skin health and environmental well-being.

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Authors Contribution

All authors are contributed equally

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