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Formulation And Evaluation of Cow Milk Soap

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ABSTRACT

Cow milk soap represents a natural, sustainable alternative to conventional soaps, leveraging the historical and scientifically validated benefits of cow milk for skincare. This project aims to develop a high-quality cow milk soap that meets modern consumer demands for natural, ethical, and effective skincare products. Cow milk is vital elements, including minerals and vitamins A, D, and E like calcium and potassium, which provide hydration, nourishment, and protective antioxidant properties. The gentle exfoliation provided by lactic acid in cow milk promotes a smoother and more radiant complexion.

The methodology involves comprehensive market research, meticulous formulation development, and rigorous testing phases, including safety, stability, and consumer testing. The research highlights the growing consumer preference for natural and biodegradable products, driven by awareness of the potential harms of synthetic ingredients and a desire for sustainability. The project will ensure the final product is not only effective but also environmentally friendly, with eco-conscious packaging and ethically sourced ingredients.

Through this structured approach, cow milk soap aims to offer superior skin benefits, including enhanced hydration, soothing properties, and gentle exfoliation, thereby positioning itself as a preferred choice in the natural skincare market. The project's success will be validated through market acceptance and positive consumer feedback.

Keywords: Nourishment, Biodegradable, Sustainability, Anti-Aging, Exfoliation

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INTRODUCTION

Natural skincare products have seen a surge in popularity in recent years, driven by a desire to return to simpler, more wholesome ingredients. Among these, cow milk soap has garnered significant attention for its unique properties and benefits. This comprehensive exploration delves into the origins, composition, benefits, and various applications of cow milk soap, presenting a thorough understanding of why this traditional soap has become a modern-day skincare favorite.^[1]

Historical Context and Origins

The use of milk in skincare is not a novel concept. Historical records suggest that milk, particularly cow milk, has been utilized for its beautifying properties for centuries. Ancient civilizations, including the Egyptians and Romans, extolled the virtues of milk baths for their skin-softening effects. Cleopatra, the renowned Egyptian queen, famously bathed in milk to maintain her skin's youthful appearance. This historical precedent underlines the timeless appeal of milk as a skincare ingredient.^[2]

The specific incorporation of cow milk into soap likely evolved alongside the development of soap-making techniques. Traditional soap-making, which involves the saponification of fats or oils with an alkali, has been practiced for millennia. The inclusion of cow milk in this process adds a layer of complexity and benefits that distinguish cow milk soap from conventional soaps.

Composition and Production Process

Cow milk soap is crafted using a blend of natural ingredients, with cow milk as a central component. The soap-making process begins with the selection of high-quality milk, often sourced from grass-fed cows to ensure the presence of essential nutrients. The primary ingredients typically include:

Cow Milk

Rich in vitamins, minerals, and proteins, cow milk is the cornerstone of this soap. It provides nourishing properties that are beneficial for the skin.

Fats and Oils

Commonly used oils consist olive oil, coconut oil, and palm oil. These oils contribute to the soap's moisturizing and cleansing properties.

Alkali (Lye)

Sodium hydroxide or potassium hydroxide is used to initiate the saponification process, transforming the fats and oils into soap.

Essential Oils and Natural Additives

These are often added for fragrance and additional skin benefits. Ingredients like lavender, chamomile, and honey are popular choices

The production process involves carefully combining these ingredients in precise ratios. The milk is usually added to the oil mixture at a specific temperature to prevent curdling and ensure a smooth texture. After that, the liquid is put into moulds and given time to cure, a process that can take several weeks. This curing period is crucial as it allows the soap to harden and develop its final properties.^[3]

Nutritional Profile and Skin Benefits

Cow milk is renowned for its rich nutritional profile, which translates into a myriad of benefits when used in soap. The key components of cow milk that contribute to its effectiveness in skincare include:

Vitamins

Cow milk is rich source of E, D, and A vitamins, all of which are beneficial for the skin.

Vitamin A promotes cell renewal, Vitamin D supports skin health and immunity, and Vitamin E acts as a powerful antioxidant.

Minerals

Essential minerals such as calcium, magnesium, and potassium help maintain skin's health and hydration.

Proteins

Casein and whey proteins found in cow milk help nourish and soothe the skin.

Lactic Acid

Lactic acid is a natural exfoliator that boosts complexion by gently removing dead skin cells.

Therapeutic Properties and Uses

Cow milk soap offers a range of therapeutic properties that make it suitable for various skin types and conditions. Some of the notable benefits include:

Moisturizing

Cow milk is ideal for skin types prone to dry and sensitive due to its high fat content, that helps to deeply exfoliate the skin.

Soothing

Cow milk's proteins and vitamins convey anti-inflammatory benefits that alleviate irritated or inflamed skin. This makes cow milk soap beneficial for conditions like eczema and psoriasis.

Anti-Aging

Cow milk contain antioxidants, like vitamin E, that work against free radicals and minimise the appearance of wrinkles and fine lines.

Cleansing and Exfoliating

For a smoother, shinier complexion, lactic acid works as a kind exfoliator, eliminating pores and exfoliating dead skin cells.

Comparative Advantage Over Conventional Soaps

When compared to conventional soaps, cow milk soap offers several distinct advantages. Conventional soaps often contain synthetic ingredients, detergents. In contrast, cow milk soap is made from natural ingredients, making it a gentler alternative. The moisturizing and nourishing properties of cow milk soap help to maintain the skin's natural balance, providing a more holistic approach to skincare.^[4]

Additionally, the presence of natural lactic acid in cow milk soap gives it a mild exfoliating effect, which is often lacking in conventional soaps. This makes cow milk soap particularly effective in promoting a healthy, glowing complexion without the need for additional exfoliating products.^[5]

Environmental and Ethical Considerations

The production of cow milk soap also aligns with growing consumer awareness regarding environmental and ethical issues. Many producers of cow milk soap prioritize sustainable and ethical practices. This includes sourcing milk from grass-fed cows that are raised in humane conditions and using organic, sustainably harvested oils. By choosing cow milk soap, consumers can support practices that are better for the environment and animal welfare.^[6]

Furthermore, cow milk soap is typically biodegradable, reducing its impact on the environment compared to synthetic soaps that can contain non-biodegradable components. This makes cow milk soap a more eco-friendly choice for conscientious consumers.

Varieties and Customization

One of the appealing aspects of cow milk soap is its versatility. Artisanal soap makers often experiment with different combinations of oils, essential oils.

Adding oatmeal can enhance the soap's exfoliating properties, while incorporating honey can boost its moisturizing effects. This customization allows consumers to select cow milk soaps that are specifically tailored to their skin type and concerns. Whether seeking a soothing soap for sensitive skin, an anti-aging formula, or an invigorating blend with essential oils, there is a cow milk soap variety to meet virtually any skincare need.^[7]

Benefits of milk soap

Hydration and Moisturization.

Gentle Exfoliation

Soothing Properties

Anti-aging Benefits

Natural Cleanser

Skin Barrier Protection

Improved Skin Texture and Tone

Suitable for All Skin Types

Rich in Nutrients

Enhances Skin Radiance

Reduces Acne

Anti-microbial Properties

Promotes Skin Healing

Environmental and Ethical Benefits

Versatility

Materials

Rose Water



Figure No. 1: Rose Water

Integrating rose water into cow milk soap enhances its beneficial properties, combining the moisturizing and nourishing effects of cow milk with the soothing and aromatic qualities of rose water.^[8] Here are the detailed roles of rose water in cow milk soap

Hydration

Enhanced Moisture Retention: Rose water is moisture balancer.

When combined with the natural fats and vitamins in cow milk, it helps to lock in moisture, ensuring that the skin remains well-hydrated throughout the day.

Softening Effect

The hydrating properties of rose water contribute to the softening of the skin.^[9]

Redness Reduction

The calming effect of rose water can also help reduce redness and blotchiness, leading to a more even complexion.

Fragrance

Natural Aroma: Rose water imparts a natural, pleasant fragrance to the soap, enhancing the overall sensory experience. This subtle, floral scent can make the bathing experience more enjoyable without the need for synthetic fragrances.

Aromatherapy Benefits: The scent of rose water can have relaxing and mood-enhancing effects, contributing to a sense of well-being.

Skin Tone

Evens Complexion

This works synergistically with the exfoliating properties of lactic acid in cow milk to promote a brighter complexion.

Radiant Glow

Regular use of the soap can enhance the skin's natural radiance, making it look more vibrant and healthier.^[10]

Almond Oil



Figure No 2: Almond Oil

Almond oil significantly enhances cow milk soap by adding deep hydration, essential nutrients, and antioxidant protection. Affluent in fatty acids like oleic and linoleic acids, almond oil provides long-lasting moisture and softens the skin, complementing the moisturizing effects of cow milk. It is packed with vit. K, A, and E, along with minerals such as zinc and magnesium, which nourish and promote skin health. The high vitamin E content offers antioxidant properties that protect against free radicals and reduce signs of aging.^[11]

Almond oil's anti-inflammatory properties soothe irritated and inflamed skin, making the soap suitable for sensitive conditions like eczema and psoriasis. It also aids in the healing of minor cuts and sunburns. As an effective yet gentle cleanser, almond oil removes impurities without clogging pores, benefiting acne-prone skin. Its antioxidants help reduce fine lines and wrinkles, improving skin elasticity and providing a youthful appearance.^[12]

Coconut Oil



Figure No. 3: Coconut Oil

Coconut oil significantly enhances cow milk soap by adding deep cleansing, moisturizing, and antibacterial properties. Its high content of fatty acids, particularly lauric acid, allows it to penetrate the skin effectively, providing deep hydration. The moisturizing properties of coconut oil complement the nourishing effects of cow milk, helping to prevent dryness and maintain skin moisture.^[13]

This is particularly beneficial for individuals with acne-prone or sensitive skin, as it helps to reduce bacteria that can cause breakouts and other skin issues.

The antioxidants in coconut oil, including vitamin E, help protect the skin from oxidative stress and environmental damage, contributing to a healthier and more youthful appearance. These antioxidants also aid in reducing the appearance of fine lines and wrinkles, promoting skin elasticity.

Coconut oil's ability to create a rich, creamy lather enhances the soap's cleansing action, ensuring that dirt, oil, and impurities are removed. This results in a thorough yet gentle cleanse, suitable for all skin types. Incorporating coconut oil into cow milk soap creates a balanced, effective, and nourishing skincare product.^[14]

Role of Cow Milk

Milk plays a crucial role in enhancing the benefits of cow milk soap, providing numerous advantages for skin health and beauty. Here's a detailed look at the specific contributions of milk

Moisturization

Hydrating Properties

Milk is rich in water content and natural fats that help to deeply hydrate the skin. This ensures the skin remains moisturized and supple.

Softening Effect

The proteins and fats in milk contribute to making the skin softer and smoother.

Vitamins and Minerals

Milk contains essential minerals and vitamins that nourish the skin and support overall skin health.

Lactic Acid

A natural alpha-hydroxy acid.^[15]

Anti-inflammatory Properties

The soothing properties of milk help to calm irritated and inflamed skin, making it ideal for sensitive skin types and conditions such as eczema and rosacea.

Healing Effects

The nutrients in milk aid in the healing of minor cuts, abrasions, and sunburns.

Cleansing

Effective Cleanser: Milk gives a mild yet effective skin wash by eliminating debris, oil, and pollutants without losing the skin's natural oils.

Improved Tone and Skin Texture

Radiant Complexion

The combination of exfoliation and hydration promotes a more radiant and glowing complexion.^[16]

Soap Base

Safe and Gentle

Natural soap bases have undergone the saponification process, ensuring they are safe and gentle for the skin.

Moisturizing Properties

One of the standout features of natural soap bases is their high glycerin content. Glycerin helps to lock it into the skin. As a result, using natural soap bases can help to moisturize and hydrate the skin, supple, and nourished.^[17]

Free from Parabens and Dyes

Unlike many commercial soaps, natural soap bases are free from parabens and synth dyes. These additives can be harsh on the skin and may cause allergic reactions or irritations, especially for those with sensitive skin.

Suitable for Sensitive Skin

Natural soap bases are an excellent choice for individuals with sensitive skin. Their gentle formulations are less likely to cause allergic reactions or skin irritations, making them a preferred option for those with delicate skin types. Whether you have dry, oily, or combination skin, natural soap bases provide a nourishing and soothing cleansing experience.^[18]

Methodology/Experimental Work

Creating cow milk soap using a melt-and-pour soap base is a simple and enjoyable process that allows to customize the soap with the benefits of cow milk.

Melt-and-pour soap bases are pre-made soap formulations that only require melting and adding your desired ingredients before being poured into molds to solidify.^[19]

Making cow milk soap using a melt-and-pour base is an accessible and rewarding craft that enables you to create high-quality soaps without the need for complex equipment or extensive knowledge of traditional soap-making techniques with its moisturizing properties and gentle nature, cow milk is an excellent choice for crafting soaps that promote healthy, radiant skin.^[20]

Equipment

Double boiler or microwave-safe bowl

Soap molds (silicone molds or loaf mold)

Mixing bowls and spoons

Measuring cups and spoons

Knife for cutting soap base

Heat-resistant spatula or spoon for stirring

Step 1: Prepare Your Workspace

Before you begin, ensure that your workspace is clean and organized. Gather all the necessary equipment, including a microwave-safe bowl, stirring utensils, measuring cups, and soap molds. Protect your surfaces with parchment paper or plastic wrap.

Step 2: Cut and Melt the Soap Base

Start by cutting the melt-and-pour soap base into small chunks. This will help it melt more easily and evenly. Transfer the chunks to a bowl that is safe to use in the microwave and zap them for 30 seconds at a time.

Stir the base after each interval until it is completely melted. Be cautious not to overheat the base, as this can cause it to become too hot.

Step 3: Prepare the Milk Powder Paste

To make a smooth paste, combine the milk powder and a tiny amount of warm water in a separate bowl. Ensure there are no lumps in the paste.^[21]

Step 4: Combine Ingredients

Once the soap base is completely melted, remove it from the heat source. Add the cow milk to the melted soap base and stir well to combine.

Step 5: Add Additional Ingredients

Next, add the aloe vera gel, almond oil, and coconut oil to the mixture, stirring continuously until all ingredients are thoroughly incorporated. This will create a creamy and nourishing soap base.

Step 6: Add Fragrance

If you like, you may flavour the soap mixture by adding a few drops of essential oils or fragrance. Stir well to distribute the fragrance evenly throughout the mixture.

Step 7: Prepare Soap Molds

Place your chosen soap molds on a flat surface. Silicone molds are ideal for creating various shapes, while a loaf mold is suitable for traditional bar shapes.

Step 8: Pour the Soap Mixture

Carefully pour the soap mixture into the prepared molds, ensuring an even distribution. If using multiple molds, divide the mixture evenly among them.^[22]

Step 9: Remove Air Bubbles

Gently tap the molds on the counter to release any air bubbles trapped in the soap mixture. This will help create smooth and uniform bars of soap. Allow Soap to Harden: Leave the filled molds undisturbed at room temperature.^[23]

Step 10: Label and Store

Once cured, label your cow milk soap bars with the date of preparation and any additional information. Store the soap bars in a cool place.

Formulation Table

Sr No.	Ingredients	Quantity	Uses
1	Cow Milk	15 gm	Moisturization
2	Soap Base	25 gm	Foundation
3	Coconut Oil	3.5 gm	Hydration
4	Almond Oil	3.5 gm	Nourishment
5	Rose Water	5 gm	Fragrance

Table No. 1: Formulation Table

Evaluation Methods

Physical Evaluation

The organoleptic quality of a natural result comprises its colour, odour, taste, and appearance. Defining these traits is the first step in the study, as it helps with the first identification of the natural substance and defines if the raw materials' scent, taste, and colour will be agreeable to patients and whether or not they will be included in the final dosage form. Alterations in the colour and smell of a raw material used in a formulation can occasionally point to a decline in the stability of the formulation (other similar circumstances). Therefore, a soap containing a blend of surfactants exists.^[24]

- 1.Colour
- 2.Odour
3. Appearance

Determination of pH

Digital pH was used to determine pH of all the produced formulations Meter. Before use, rinse the electrode. Weigh the sample into a beaker. Dissolve it in water (for making solution required). Calibrate the pH meter by using buffer solutions.^[25]

Skin Irritation Test

A test for skin irritancy was done on the soap design. The preparation is not irritated or reddening. A 24-hour period was used to observe the situation.

Washability

We looked at the structure of the soap alongside how easily it could be washed with water.^[26]

Foam ability

Around 2.0 grammes of milk soap were obtained and diluted in 50 millilitres of distilled water in a 100-millilitre graduated measuring cylinder to see if it could produce foam. It was shaken for around 10 minutes during the course of the measurement. After 10 minutes, the foam's height was measured.

Foam Retention Time

100 millilitre graduated measuring container was filled with 25 millilitres of the one percent soup solution. Ten times, the cylinder was shaking as covered with palms. For four minutes, the volume of foam was taken at every one minute.

Stability testing

For seven days, the produced formulation was subjected to accelerated stability testing at room temperature. Subsequently, the formulation was analysed for 30 days at $40^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The formulations were observed on the first day, the 15th day, and the 30th day for all evaluation parameters. These were kept at both ambient temperature and high temperature.

RESULT

Sr No.	Parameter	Observation
1	Color	Cream White
2	Odor	Characteristics
3	Appearance	Solid
4	pH	7-9
5	Skin Irritation	No Irritation
6	Washability	Good
7	Foam Ability	2.5 cm
8	Foam Retention Time	10 min

Table No. 2: Parameter and Observations

DISCUSSION

Formulating cow milk soap involves a precise combination of ingredients and meticulous processes to harness the skincare benefits of cow milk. Rich in vitamins A, D, and E, along with lactic acid, cow milk provides excellent moisturizing and exfoliating properties, making it a desirable component in soap making.

To create cow milk soap, a variety of base oils are utilized. Olive oil is chosen for its superior moisturizing qualities, coconut oil contributes to hardness and a rich lather, palm oil adds stability and further hardness, while castor oil is used to enhance the soap's lather. The process begins with preparing the ingredients, where cow milk, either fresh or powdered, is typically frozen before being mixed with lye (sodium hydroxide). Freezing the milk helps prevent scorching from the heat generated during the lye mixing.

This lye-milk mixture is then gradually added to the melted base oils. Continuous stirring is essential until the mixture reaches trace, the point at which it thickens and is ready for additional ingredients. Essential oils can be added for fragrance, and other additives like oatmeal or honey can be included for their exfoliating and moisturizing properties, respectively.

After achieving trace, the soap mixture is poured into molds and allowed to set for 24 to 48 hours before being unmolded. The soap undergoes a curing process, typically lasting 4 to 6 weeks, which allows excess water to evaporate and the soap to harden, enhancing its durability and quality.

Chemically, the soap's pH level should ideally fall between 7 and 10 to ensure it is safe for skin use. Ensuring there is no free alkali, which can cause skin irritation, is also crucial, typically tested using indicators like phenolphthalein.

Performance evaluations focus on the soap's cleansing ability, ensuring it effectively cleans without leaving a residue. Its moisturizing effect is another critical aspect, evaluated through user feedback and specific skin moisture tests. Patch tests are conducted to check for potential skin sensitivity or allergic reactions.

User feedback is integral to the evaluation process. Sensory evaluations gather opinions on the soap's fragrance, lather, and overall feel on the skin. Preference testing compares cow milk soap with other soaps to gauge user preferences regarding moisturizing effect, fragrance, and cleansing ability.

CONCLUSION

The determination of pH in cow milk soap is a vital quality control measure that ensures the soap is both effective and safe for consumer use. Cow milk soap, known for its nourishing and moisturizing properties, must maintain a pH level that complements the skin's natural pH to avoid irritation and dryness. The optimal pH range for cow milk soap is between 7 and 9, which is close to the skin's natural pH and ensures the soap is gentle while providing effective cleansing.

The process of pH determination involves preparing a soap solution by dissolving a measured amount of soap in distilled water, followed by measuring the pH using either a pH meter or pH test strips. Both methods are straightforward and provide reliable results. Using a pH meter offers precise readings and is ideal for regular monitoring, while pH test strips provide a quick and easy alternative for approximate pH values.

Maintaining the pH within the ideal range is crucial for several reasons. Conversely, a pH that is too low (acidic) might not cleanse effectively and could also cause skin irritation. Therefore, regular pH testing during the production process helps in maintaining consistent product quality and ensuring consumer safety.

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