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FORMULATION AND EVALUATION OF HERBAL MEDICATED SOAP CONTAINING Calophyllum inophyllum SEED OIL

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Abstract:
Herbal cosmetics have gained significant attention due to their safety, biocompatibility, and therapeutic potential. The present study aimed to formulate and evaluate a herbal medicated soap containing oil of Calophyllum inophyllum (Family: Clusiaceae), commonly known as Tamanu oil, known for its antimicrobial, anti-inflammatory, wound-healing, and antioxidant properties. The seed oil was incorporated into a soap base prepared by the melt and pour method using coconut oil, olive oil, castor oil, sodium hydroxide, distilled water, glycerine, and lavender oil as fragrance. The formulated soap was subjected to various physicochemical and performance evaluation tests including organoleptic characteristics, pH determination, foam height and foam retention, skin irritation test, and antimicrobial activity by agar well diffusion method. The prepared formulation showed satisfactory appearance with a greenish cream colour and pleasant odour. The soap exhibited good foam stability, adequate hardness, and acceptable moisture content. No signs of skin irritation were observed. Significant antimicrobial activity was demonstrated against common skin pathogens such as Staphylococcus aureus, Escherichia coli. The results indicate that the formulated herbal soap containing Calophyllum inophyllum oil possesses desirable physicochemical properties and promising antimicrobial potential, suggesting its suitability as a safe and effective herbal cleansing agent for dermatological applications.

KEY WORDS: *Herbal soap, Calophyllum inophyllum, Tamanu oil, Melt and Pour method, Physicochemical Evaluation*

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INTRODUCTION:

Everybody knows that soap is a typical cleansing agent. Different writers offer diverse definitions for soap.' It is referred to as any water-soluble salt of fatty acids that has eight or more carbon atoms. Various uses, including washing and bathing or medication, are possible that make them suitable for the production of soaps. The soap's cleansing ability is attributed to the negative ions on the hydrocarbon chain linked to carboxylic group of fatty acids. Most commonly used to clean surfaces is soap, which contains water due to the hydrocarbon chain's affinity with oil and grease and its carboxylic group. Other elements are added to the composition alongside basic raw materials to enhance its usage. The addition of medicinal ingredients to soaps is a method used to produce medicated soap. This process has various applications. Other metals, including calcium, magnesium, and chromium are added to the production of metallic insoluble soap, which is not intended for cleaning purposes but is utilized for other purposes. The soap's hardness and other properties are influenced by the presence of a metallic element in the salt. If the same type of fat or oil is used, herbal soap can replace conventional soap with a natural formula that includes botanical herbs and plant-based ingredients, while sodium salts provide soap without the necessary hardness. Herbal soap has become increasingly popular due to its environmental and skin-friendly features. Due to their lack of harsh chemicals and artificial fragrances, these soaps are ideal for those with sensitive skin. They are also eco-friendly, and use natural ingredients for a more gentler, more sustainable option for personal care. Herbal soap is also environmentally friendly. It is made from biodegradable and non-toxic ingredients. Unlike other natural soaps, Herbal soap is free from animal-derived ingredients and is intended to be used by conscious consumers. Various beneficial effects can be found in herbal soap, including the ability to soothe and heal the skin, the natural scent of the herbs, as well as aromatherapy. Herbal soap's natural components have been found to possess antibacterial, antifungal, and anti-inflammatory qualities, which make it a valuable treatment for skin conditions like acne, eczema, or psoriasis. Various herbs possess individual traits that contribute to skin health and beauty. Herbal soap is becoming more popular as a natural and eco-friendly option for personal care, especially in light of the growing concern about synthetic chemicals. The herbs are rich in essential oils, vitamins, minerals, and phytochemicals that have therapeutic benefits for the skin. Herbal soap is a popular choice for those with dry skin, as it can be soothing, refreshing, and beneficial to the skin. Seeds, rhizomes, and roots are the primary components of herbal soaps. The antibacterial, anti-aging, antioxidant and antiseptic properties are also present. Natural herbs are used to treat a wide variety of skin ailments, making herbal soap more effective than commercially available soaps. Additionally, herbal remedies contain no synthetic dyes, flavours or fluorides, and are considered natural by many medical practitioners. Value, affordability, accessibility, and compatibility. Herbal cosmetics are rapidly becoming a global trend, reflecting the abundance of precious items provided by Mother Nature. These soap preparations can be classified as medicines or pharmaceuticals because they contain antibacterials and antifungal agents. They often incorporate plant parts like leaves, roots stems, and fruit to treat wounds effectively; prevent disease from occurring; and enhance overall health and wellness. From its moisturizing properties to its long-lasting fragrance, soap has many qualities. Integrating herbal soap into your skincare regimen is a natural and efficient method for improving your complexion. A multitude of advantages are provided by this amazing product, resulting in glowing skin.'[1-12]

FUNCTIONS OF SOAPS:

- Efficient skin washing without depletion of the skin's natural oils. Eliminating debris, oil, and pollutants for the skin.
- Stay away from stressful circumstances, chemicals, and allergies.
- The product should have enough foam to satisfy the user.
- Promote skin health, eliminate body odor, and rejuvenate the skin.
- The treatment of various epidermal disorders, such as acne, psoriasis, and eczema, is available.[13]

HERBAL SOAP HAS ADVANTAGES OVER SYNTHETIC SOAP:

Natural elements found in herbal soap, such as plant extracts, essential oils, and herbs, provide a number of benefits over synthetic soaps.

1. Mild on the skin: Herbal soaps are often kinder and milder on the skin than synthetic soap, which makes them appropriate for skin types that are more sensitive.
2. Natural ingredient: They frequently include skin nourishing and hydrating natural ingredients including shea butter, coconut oil, olive oil, and aloe vera.
3. Chemical-Free: The absence of harsh chemicals, artificial perfumes, and synthetic colours in herbal soaps lowers the possibility of allergic responses and skin irritation.
4. Environmentally Friendly: Compared to synthetic soaps, the herbal ones are typically biodegradable and environmentally friendly as they are made with natural ingredients.
5. Aromatherapy advantages: By combining essential oils with herbal soaps, aromatherapy

advantages including stress alleviation, mood enhancement, and relaxation can be experienced.
6. Natural antibacterial qualities: Certain herbal substances, like neem and tea tree oil, have antibacterial qualities that assist to cleanse and shield the skin from infections.
7.Hypoallergenic: Herbal soaps are often hypoallergenic, meaning they are less likely to cause allergic reactions compared to synthetic soaps that may contain harsh chemicals and artificial fragrances.[14,15]

DISADVANTAGES OF HERBAL SOAPS:

- Variable Quality: Herbal soaps are available in a wide range of brands and formulations, and the quality may vary. Some herbal soaps may contain lower quality ingredients or lack the desired efficacy, which can affect their performance.
- Limited Lather: Herbal soaps may not lather as much as synthetic soaps due to their natural ingredients. While lather is not necessarily an indicator of cleaning efficacy, some people may prefer a rich lather during their bathing routine.
- Shorter shelf life : Because they usually don't contain preservatives, which could cause them to expire sooner than synthetic detergents.[16,17]

  AIM: To formulate and evaluate a herbal soap using tamanu oil obtained from Calophyllum inophyllum.

OBJECTIVE:

• To extract tamanu oil from the seeds using a suitable extraction method.
• To evaluate the prepared soap for organoleptic characteristics and Physicochemical Parameters.
• To determine the suitability of the formulated soap for herbal cosmetic applications.

MATERIALS AND METHODS:

Ingredients: Calophylluminophyllum extract (Tamanu oil), Coconut oil, Olive oil, Castor oil, Sodium hydroxide, Glycerine, Essential oil (lavender oil)
Collection: Mature fruits were collected during the fruiting season The outer pulp was removed, seeds were washed and shade dried for 7-10 days, dried seeds were stored in air tight containers. Oil is extracted from the seeds and the oil is stored in amber coloured bottle.
Extraction: 100 g of seed powder was placed in Soxhlet apparatus. Petroleum ether (or n hexane) was used as solvent. Extraction was carried out for 6–8 hours. Solvent containing oil was collected. Solvent was evaporated using rotary evaporator. Extracted oil was dried and stored in amber bottle.

CALOPHYLLUM INOPHYLLUM



It is also referred to as Tamanu or Beauty leaf, and the Alexandrian laurel, Indian laurels etc. Beach Calophyllum, Beach touriga, Kamani, Laurelwood, Honne, and other similar names are present in the area. Different regions of the world. Medium-to-large trees with a slow growing process are known as Daok. With leather-covered leaves, furry bark, and a fragrant white coloration, the plants can grow up to 20 meters tall. The flowers have round-shaped fruits with large seeds and a broad crown that spread out. A collection of leaves, stems and roots along with fruits, flowers and seeds. Flavonoids, coumarins, and other essential phytochemicals are found in this plant. Wound healing can be achieved through the use of xanthones and other fatty acids. Various drugs have various properties such as anti-aging, antiseptic, and antibacterial. Anti-inflammatory, antibacterial, and antiviral effects. The oil. C. inophyllum nuts are the source of the resinous neoflavanoid and its accompanying edible substances. Pyranocoumarin compounds can be found alongside common fatty acids, which are known to have anti-oxidant properties. Have different medicinal properties. C. inophyllum seed oil has been used as a traditional medicine to treat various illnesses. The treatment includes wound healing, pain relief, insect repellent, and oral remedies for skin. Health, joint discomfort, scar reduction, anti-aging and skincare, hair care, skin care. [18,19]

Benefits of Tamanu Oil

Tamanu oil, a fixed vegetable oil obtained from the seeds of Calophyllum inophyllum, possesses multiple dermatological benefits due to its rich phytochemical composition.

- Antioxidant Activity:
  Tamanu oil contains significant antioxidant constituents that help neutralize free radicals. By reducing oxidative stress, it may contribute to delaying premature skin aging and protecting cellular integrity.
  Potential Photoprotective Properties:
  Some studies suggest that tamanu oil exhibits the ability to absorb ultraviolet

(UV) radiation within certain wavelength ranges. However, it should not replace conventional sunscreens, and further research is required to confirm its efficacy as a primary photoprotective agent.

- Antimicrobial Activity:
  The oil demonstrates antibacterial and antifungal properties, making it beneficial in managing microbial skin infections. It may support treatment of acne, eczema-associated infections, minor wound contamination, and superficial fungal infections.
- Anti-inflammatory Effect in Eczema:
  Due to its anti-inflammatory and antimicrobial properties, tamanu oil may help alleviate symptoms associated with eczema, including redness, irritation, and microbial colonization.
- Wound Healing Activity:
  Tamanu oil has been reported to enhance wound contraction, stimulate fibroblast proliferation, and promote collagen synthesis. These mechanisms contribute to accelerated wound healing and tissue regeneration.
- Scar Reduction:
  By promoting collagen formation and skin remodeling, tamanu oil may aid in minimizing the appearance of scars over time.
- Management of Minor Burns and Sunburn:
  Its anti-inflammatory action may help soothe mild burns and sunburn-related irritation.

  Risks and Safety Considerations:
  Although tamanu oil provides several dermatological benefits, certain precautions must be observed:
- Since it is derived from the seeds of a nut-bearing tree (Calophyllum inophyllum), individuals with nut allergies should avoid its use.
- The oil is intended strictly for topical application and should not be ingested, as internal consumption may lead to toxicity.
- Skin irritation and allergic reactions have been reported in sensitive individuals.
- Before beginning regular use, a patch test is advised. A small quantity should be applied to the inner forearm or elbow region twice daily for seven days to monitor for adverse reactions such as redness, itching, swelling, or rashes.[20]

Coconut oil:

The coconut palm, also known as cocos nucifera, is a significant source of biodiversity. Economically important tropical plants. Coconut oil is widely used in cooking and other applications. Cosmetic and pharmaceutical industries. The soap industry heavily relies on this component in its production. Owing to its excellent lamination and degreasing capabilities. The dried kernel (endosperm) is the biological source of this oil, which is a permanent product. Of Cocos nucifera.

Family: Arecaceae.

Part Used: Dried endosperm (copra)

Morphological Characteristics: The coconut palm has a slim and petite trunk, which can reach 3.5 metres in height. Leaves are. Long and pinnate. A fibrous and large fruit with a white edible kernel. Lauric acid, Myristic acid and Palmitic acid are the chemical compounds, Caprylic acid, Capric acid.

At a room temperature, the substance appears to be white to pale yellow solid/ semi-solid. Temperature; characteristic odour.

Pharmacological and Cosmetic uses include: Antimicrobial, Emollient, Moisturizer, etc. Skin softening agent.

Role in Soap Formulation: Produces rich lather. Provides good cleansing properties. Contributes to hardness of soap. Provides antimicrobial properties through the use of lauric acid.[21]

Castor oil:

The castor plant is a common name for Ricinus communis. The oil obtained from. Both pharmaceutical and cosmetic industries rely heavily on its seeds. In soap. By preparing and conditioning, castor oil enhances both the stability of the lather and effectiveness in conditioning.

Effect: The skin is kept moisturized by its humectant properties. Ricinus communis seeds are the source of castor oil, which is biologically beneficial.

Family: Euphorbiaceae.

Part Used: Seeds. The chemical components are ricinoleic acid (85-90%), Oleic acids, and Linolenic acid.

Physically, the liquid is pale yellow and viscous.

Pharmacological Activities: Emollient. Anti-inflammatory. Moisturizing. Role in Soap Formulation: Enhances lather stability and creaminess. Acts as humectant (retains moisture) Improves conditioning properties. Adds mildness to soap.[22]

Olive oil:

The olive tree is an indigenous species of Olea europahedra. This particular species is also known as the petiole. Mediterranean region. Cosmetics often incorporate the use of olive oil because of its beneficial effects. Conditioning and moisturizing effects. It is regarded as one of the most gentle oils used.'". In soap making. The ripe fruit of Olea europaeum is the source of olive oil in terms of biological origin.

Family: Oleaceae.

Part Used: Fruit pulp. The chemical composition consists of Oleic acid, Linoleic Acid, and Palmitic

acid (55-83%). Squalene, Polyphenols. A clear liquid ranging from yellow to green appears physically.
Pharmacological Properties: Antioxidant. Anti-inflammatory. Skin conditioning. Anti-aging.
Role in Soap Formulation: Provides mildness and conditioning effect. Produces stable, creamy lather. Moisturizes and nourishes skin. Suitable for sensitive skin formulations.[23]

Lavender oil:
Aromatic plants such as lavender, also known as Lavandula angustifolium, are cultivated. The use of this plant for perfumes and cosmetic products is widespread. The Steam distillation is the means by which essential oil is obtained. It's volatile in nature. Lavender oil, a biological resource, is obtained through the steam distillation of flowering tops. Of Lavandula angustifolia.
Family: Lamiaceae.
Part Used: Flowering tops. Linalool, lutein, Camphor, Terpinen-4-olamine, and Linalyl acetate are all present in the chemical composition. Colourless to pale yellow volatile oil with a pleasing floral aroma. Aroma.
Pharmacological Activities: Antimicrobial. Relaxant. Anti-inflammatory. Aromatherapeutic.
Role in Soap Formulation: Provides fragrance. Exhibits antimicrobial and antiseptic properties. Offers calming and soothing effect. Enhances product acceptability.[24]

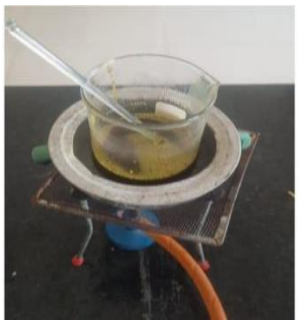
FORMULATION:

S.No	Ingredients	Quantity	Use
1.	Calophyllum inophyllum	15g	Active ingredient
2.	Coconut oil	30g	Cleaning & lather
3.	Olive oil	25g	Moisturizer
4.	Castor oil	10g	Foam stabilizer
5.	NaOH	10g	Saponifying agent
6.	Distilled water	25ml	Solvent
7.	Glycerine	3g	Humectant
8.	Lavender oil	1ml	Fragrance

PROCEDURE:

Step 1: Preparation of Soap Base
Take the required quantity of melt and pour soap base. Cut the soap base into small cubes to ensure uniform and easy melting.
Step 2: Melting of Soap Base
Transfer the soap base cubes into a clean beaker or double boiler. Heat using a double boiler method or microwave heating. Heat slowly with continuous stirring until the soap base melts completely. Avoid overheating to prevent degradation of ingredients.
Step 3: Addition of Oils
Add measured quantities of:
Calophyllum inophyllum oil (15g), Coconut oil (30g), Olive oil(25g), Castor oil(10g).Stir gently to obtain a uniform mixture.
Step 4: Addition of Moisturizing Agent. Add glycerine (optional) to improve moisturizing property. Mix thoroughly.
Step 5: Addition of Colour and Fragrance
Add essential oil (Lavender oil) for fragrance and antimicrobial property. Stir slowly to avoid formation of air bubbles.
Step 6: Pouring into Moulds
Pour the molten soap mixture into clean and dry silicone or plastic moulds. Spray a small amount of rubbing alcohol on the surface to remove air bubbles.
Step 7: Cooling and Solidification
Allow the soap to cool and solidify at room temperature. The soap generally hardens within 1–2 hours.
Step 8: Removal and Storage
Carefully remove the hardened soap from the mould. Wrap the soap in butter paper or suitable packaging material. Store in a cool and dry place.[25]






Evaluation Tests of Herbal Soap

The formulated herbal soap was evaluated for organoleptic, physical, antimicrobial, and skin irritation properties.

1. Organoleptic Evaluation

Colour: Greenish cream
Odour: Pleasant
Appearance: Good

2. Physical Evaluation

1.pH Determination

Method: 1–2 g soap dissolved in 100 ml distilled water.
pH meter calibrated using buffer solutions (pH 4, 7, 10).
Electrode immersed in soap solution and reading recorded.
Result:
The pH was found to be 9.5, indicating basic nature and within acceptable range for soap.



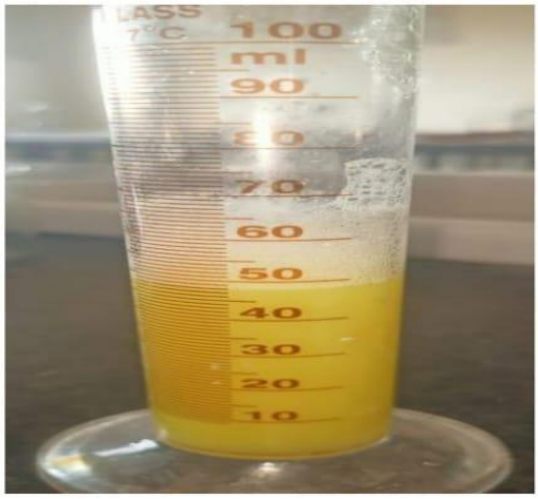
2. Foam Retention Test

1% soap solution (50 ml) shaken 10 times in a 250 ml measuring cylinder.
Foam volume measured after 1 and 5 minutes.
Result:
Foam volume after 1 minute: 105 ml
Foam volume after 5 minutes: 100 ml
Foam retention time: Within acceptable range (5–10 minutes)

3. Foam Height Test



Soap solution poured from 30 cm height using Ross-Miles method.
Foam height measured.
Result:
Foam height = 14.5 cm (Good foaming property)



4. Antimicrobial Activity

Test organisms:E. coli,S. aureus
Method: Agar plate and zone of inhibition method.
Gentamycin used as standard.
Results:
Organism Gentamycin (mm) Herbal Soap (400 mg) (mm)

E. coli 27 mm
25 mm
S. aureus 30 mm
20 mm
Antibacterial activity increased with concentration. Zone of inhibition ≥10 mm confirms good antimicrobial activity.

5. Skin Irritation Test

Patch test conducted on 5 volunteers.
Observed for redness, itching, and rashes.
Result:
No irritation observed. Soap considered non-irritant (Score 0–1).



Conclusion of Evaluation:
The formulated herbal soap showed:
Acceptable pH
Good foam retention and foam height
Significant antimicrobial activity
No skin irritation
Thus, the herbal soap was found to be safe, effective, and suitable for skin application.

CONCLUSION:

The present study successfully formulated and evaluated a herbal medicated soap incorporating Calophyllum inophyllum seed oil using the cold process method. The formulated soap exhibited satisfactory physicochemical characteristics including acceptable pH, good foam stability, adequate hardness, suitable moisture content, and high total fatty matter value. Organoleptic evaluation revealed a uniform texture, greenish cream color, and pleasant fragrance, indicating good aesthetic and consumer acceptability.

The antimicrobial study demonstrated significant inhibitory activity against common skin pathogens such as Staphylococcus aureus, Escherichia coli, and Candida albicans, confirming the therapeutic potential of the herbal ingredient. Furthermore, the skin irritation test showed no signs of redness, itching, or irritation, suggesting that the formulation is safe for topical application.

Overall, the results indicates that the herbal soap prepared with Calophyllum inophyllum oil is stable, effective, and safe, and can serve as a potential natural alternative to synthetic medicated soaps for managing minor skin infections and maintaining skin hygiene.

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