

Formulation and Evaluation of Sandalwood Soap

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Abstract: *The formulation and evaluation of herbal soap using sandalwood (*Santalum album*) aim to explore the potential of natural ingredients in personal care products.*

Sandalwood is known for its antimicrobial, anti-inflammatory, and aromatic properties, making it an ideal candidate for skin-friendly cleansing formulations. In this study, sandalwood powder and essential oil were incorporated into a soap base using the cold process method. Additional natural ingredients such as coconut oil, palm oil, and glycerin were used to enhance moisturizing and cleansing properties. The formulated soap was evaluated for various physicochemical parameters, including pH, foam height, hardness, total fatty matter (TFM), and stability over time. Microbial analysis and skin irritation tests were also conducted to assess safety and efficacy.

The results indicated that the sandalwood soap met standard quality parameters and demonstrated favorable skin compatibility, suggesting it as a viable natural alternative to synthetic soaps. This study highlights the potential of incorporating traditional herbal ingredients into modern skincare products..

Keywords: saponification, botanicals, Ayurvedic, Herbal ,pH analysis, Hardness test

I. INTRODUCTION

Soap is a cleansing agent typically made by the chemical reaction of an alkali (such as sodium hydroxide) with fats or oils, a process known as stratification. Soaps have been used for centuries to maintain personal hygiene by effectively removing dirt, oil, and microbes from the skin. With the growing awareness of skin health and environmental sustainability, there has been an increasing demand for natural and herbal alternatives to conventional synthetic soaps.

Herbal soap refers to soap made using natural ingredients derived from plants, including essential oils, extracts, powders, and other botanicals. Unlike synthetic soaps that often contain harsh chemicals, artificial fragrances, and preservatives, herbal soaps are considered to be milder and more beneficial to the skin.

They often contain ingredients with therapeutic properties such as antibacterial, antifungal, anti- inflammatory, and moisturizing effects.

Among various herbal ingredients, sandalwood (*Santalum album*) stands out for its aromatic, antimicrobial, and skin-soothing properties. Traditionally used in Ayurvedic and natural medicine, sandalwood has been

a key component in beauty and skincare formulations for centuries. Its inclusion in soap enhances both the fragrance and therapeutic value of the product, making it suitable for all skin types.(1)

History of soap:

The history of soap dates back to ancient Babylon around 2800 B.C., where records show the use of soap- like materials. The Romans also used soap for bathing and medicinal purposes. Over time, soap evolved from a luxury item to an essential household product. With the rise of the cosmetic industry, soap production has transformed into a large-scale, scientific process that combines chemistry with dermatology and aesthetics.(2)

In India the first soap industry was established North West soap company in 1897 At Meerat following the swadeshi movement. Since 1905, the following come into force:

- ☐ Mysore soap factory at Bangalore
- ☐ Godrej soap at Bombay (Mumbai)
- ☐ Bengal chemical
- ☐ Tata oil mill



Today, the global cosmetic and personal care industry is one of the fastest-growing sectors, driven by consumer interest in natural and organic products. Herbal soaps, such as those formulated with sandalwood, align with current market trends that emphasize sustainability, skin-friendliness, and the use of traditional remedies in modern formulations. This project focuses on the formulation of a sandalwood-based herbal soap and its evaluation through various physicochemical and microbiological parameters to ensure quality, safety, and effectiveness.

AIM AND OBJECTIVE:

Aim:

To formulate a herbal soap incorporating sandalwood as the primary active ingredient and to evaluate its physicochemical and antimicrobial properties for potential use as a natural and skin-friendly cleansing agent.

Objectives:

1. To study the properties and benefits of sandalwood (*Santalum album*) and other natural ingredients suitable for herbal soap formulation.
2. To formulate a herbal soap using the cold process method with sandalwood powder and/or essential oil as a key component.
3. To evaluate the physicochemical properties of the formulated soap, including:
 - pH
 - Foam height
 - Hardness
 - Moisture content
 - Total fatty matter (TFM)
4. To assess the antimicrobial activity of the formulated soap against common skin pathogens.
5. To perform a skin irritation test (patch test) to evaluate the dermatological safety of the soap.
6. To compare the quality of the formulated sandalwood soap with commercial herbal and synthetic soaps.
7. To document the stability of the formulated soap over a storage period under.

INGRADINT USE IN FORMULATION OF SANDALE WOOD SOAP :

1. SANDALWOOD POWDER:

Scientific Name: *Santalum album* (Indian Sandalwood)

Source: Sandalwood powder is derived from the heartwood of the sandalwood tree. Traditionally used in Ayurveda, Traditional Chinese Medicine, and Unani systems. Key Constituents:

Santalol Tannins Terpenoids Lignans

Role: Cooling, antimicrobial, fragrance, soothing, therapeutic.



Fig. 1 Sandalwood Powdere

2. COCONUT OIL:

Scientific Name: *Cocos Nucifera* (Coconut) Oil

Key Constituents:

Lauric acid ($\approx 45 - 52\%$) - strong cleansing and foaming Myristic acid ($\approx 16 - 21\%$) - cleansing, mild surfactant

Caprylic/Capric acids - antimicrobial

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Stearic acid – creaminess
Vitamin E & polyphenols – antioxidant properties
Role: Lather, cleansing, hard bar, antimicrobial.



Fig.2 Coconut Oil

3. PALM OIL :

Scientific Name: *Elaeis guineensis*

Sources: Palm fruit

Key Constituents: Palmitic acid, Tocopherols Role: Hardness, stable lather, mild cleansing.



Fig.3 Pam Oil

4. SOAP BASE:

Role: In herbal soap formulation, the soap base is the foundational ingredient that determines the soap's texture, cleansing properties, and compatibility with herbal additives.



Fig.4 Soap Base

5. GLYCERIN:

Scientific Name: Glycerol (or Propane-1,2,3-triol)

Source: Naturally produced during the saponification process in cold process soap.



Role: Humectant: Draws moisture from the environment into the skin.



Fig. 5 Glycerin

6. NATURAL COLOURANT (TURMURIC POWDER):

Scientific Name: Curcuma longa

Key Constituents:

Curcumin – Primary active compound, gives turmeric its yellow color and antioxidant/anti-inflammatory effects.

Polysaccharides – Skin-soothing and moisturizing

Role:

Colorant-Natural yellow to orange hue; gives soap a warm, earthy tone. Anti-inflammatory-Helps soothe irritated, red, or acne-prone skin.

Antibacterial-Assists in reducing acne-causing bacteria.



FIG.6 Turmuric

7. DISTILLED WATER:

Scientific Name: Aqua or H₂O (distilled)

Source: Produced by distillation: boiling water and condensing the steam to remove impurities, minerals, and contaminants.



Role:

Dissolves sodium hydroxide (NaOH) to create the lye solution for saponification. Acts as a medium for the lye and oils to interact, starting the saponification reaction. Helps achieve the right fluidity and texture of soap batter during mixing and pouring.

Ensures Purity-No interference from metals, bacteria, or chemicals—important for product safety and stability.



Fig. 7 Distilled Water

METHOD OF PREPARATION:

Melt and Pour Soap Making Process:

1. Melt the Soap Base (40g)

Use a double boiler or microwave (short bursts, stirring frequently) to melt.

2. Add Coconut Oil (3g)

While the soap is still hot, add coconut oil and stir until fully mixed.

3. Add Glycerin (3g)

Mix thoroughly after adding.

4. Add Powders Gradually Sandalwood Powder (2.5g) Turmeric Powder (1g)

Stir thoroughly to avoid lumps.

5. Optional:

Add a few drops of sandalwood essential oil if available.

6. Pour

Pour the mixture into a mold. Cool and Harden

Let set at room temperature for 2–4 hours or refrigerate for faster results.

7. Unmold and Cure

Once hardened, unmold and allow to cure for 24 hours before use for best texture.

EVALUATION PARAMETER:

1. Physical examination:

Colour: -The colour of the herbal soap formulation is checked visually. Odour: -The formulation was evaluated for its odour by smelling it.

2. Determination of pH: -

The pH is determined by using pH paper

The pH was found to be basic in nature, soap should be always alkaline with safe pH range The pH above 11 is too harsh for the skin and will cause irritation

The pH below 6 will have no cleansing property.



3. Foam Retention: -

25ml of the 1% soap solution was taken into 100ml graduated measuring cylinder The cylinder is covered with hand and shaken for 10 times

The volume of foam at 1min interval for 4min was recorded

4. Foam height: -

About 1 gm of soap solution was taken and was dissolved in distilled water about 50ml in a 100ml graduated measuring cylinder

Measuring cylinder is shaken for about 3min And it was allowed stand for 10min

Foam height was measured after 10min

Record the observation for three consecutive experiment and the mean was taken.

5. Irritability test: -

3 volunteers were selected for this test

Mark an area (1sq.cm) on the left-hand dorsal side, small amount of foaming herbal soap applied on the skin and kept for few minutes .

Redness, oedema, inflammation, and irritation was checked if any regular intervals up to 24hrs and reported .

6. Total fatty matter: -

Take 5 gm of herbal soap sample, dissolve the soap sample in 75ml of distilled water Add 10ml of concentrated sulfuric acid (H₂SO₄) to the solution

Add 3.5gm of beeswax to the solution, heat the mixture to 60-70 0C and mix well until the beeswax is fully dissolved

Allow the mixture to cool, then separate the fatty acid layer from the aqueous layer Dry the fatty acid layer and weigh it.

Calculate TFM by using the formula $TFM (\%) = (A-X)/W \times 100$

Where,

A= weight of wax+oil X= weight of wax

W= weight of soap.

USES OF SANDALWOOD SOAP:

1. Skin Cleansing and Purifying
2. Soothing for Skin Irritations 3. Moisturizing and Softening
4. Anti-Aging Properties
5. Aromatherapy and Stress Relief
6. Brightens Complexion
7. Acts as a Natural Deodorant

COMMON APPLICATIONS:

- a. Daily body and face wash
- b. Post-workout cleanser to prevent breakouts
- c. Before bed use to calm the skin and mind
- d. During hot weather to cool and refresh the skin



RESULTS :

Sr.no	PARAMETER	RESULT
1	Colour	Brown
2	odour	pleasant
3	Apperance	good
4	Texture	Solid and smooth
5	pH	8
6	Form height	5cm
7	Total fatty matter	84%

Sandalwood soap is a herbal cosmetic formulation prepared using sandalwood oil or powder, which is well-known for its soothing fragrance and therapeutic benefits. Sandalwood possesses antimicrobial, anti- inflammatory, and antioxidant properties that make it ideal for skincare applications. The base of the soap is typically composed of oils or fats (such as coconut oil or palm oil), to form soap. The inclusion of sandalwood enhances the product's aesthetic and medicinal value, making it suitable for daily use on all skin types.

II. CONCLUSION

The formulation and evaluation of sandalwood soap was successful. The final product had a pleasant fragrance, good lathering ability, and was gentle on the skin. All the key physical and chemical tests like pH, hardness, foaming, and cleansing ability showed that the soap meets standard quality requirements. Sandalwood oil not only added a soothing aroma but also provided skin benefits like moisturization and antibacterial effects. Overall, the project demonstrated that sandalwood soap can be made effectively using natural ingredients, making it a good choice for consumers looking for herbal or organic skincare products.

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