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# Development and Evaluation of Rosemary Infused Soap: A Novel approach to Skincare

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**Abstract**
The shift towards herbal and naturally derived skincare products has increased interest in plant-based cosmetic formulations. Rosemary (Rosmarinus officinalis L.) is a widely used medicinal plant known for its beneficial effects on skin due to its antioxidant and antimicrobial properties. In this study, a rosemary-infused soap was formulated using the saponification technique to develop a natural skincare product. The prepared soap was evaluated for various physicochemical parameters, including pH, hardness, foam stability, moisture content and to determine its quality and stability. Skin irritation study was carried out to assess safety. The formulated herbal soap exhibited satisfactory physicochemical characteristics, good foaming properties, and a pH suitable for skin application. The soap also demonstrated effective activity without causing any signs of skin irritation. These findings indicate that rosemary-infused soap is a safe and effective herbal formulation with potential application in daily personal hygiene. The study supports the use of medicinal plant extracts as natural alternatives to synthetic ingredients in cosmetic products.

**Keywords:** Rosemary; Plant-based soap; Natural skincare; Cosmetic formulation; Personal care; Physicochemical evaluation

## Introduction

Soap is one of the most essential products used for maintaining personal hygiene and preventing the spread of microorganisms. Traditionally prepared using natural fats and alkaline substances, soap has evolved into a widely used daily-care product available in various formulations. Its cleansing action is based on an amphiphilic molecular structure consisting of a hydrophilic head and a hydrophobic tail. When used with water, soap forms micelles that trap oil, dirt, and impurities, allowing them to be easily removed during rinsing. In addition to cleansing, soaps contribute to skin health by maintaining cleanliness and protecting the skin from harmful microbes. Modern soap formulations often include moisturizing and protective agents to reduce dryness and irritation. In recent years, herbal ingredients have gained attention due to their natural origin and therapeutic benefits, offering safer alternatives to synthetic additives. Rosemary (Rosmarinus officinalis L.) is a medicinal plant known for its antioxidant, antimicrobial, and anti-inflammatory properties. Incorporating rosemary into soap formulations can enhance antimicrobial activity and support overall skin health. With increasing concern over the environmental and dermatological impact of synthetic chemicals, there is a growing demand for natural and eco-friendly personal care products. The development of rosemary-infused soap represents a sustainable and effective

approach to herbal skincare. This study focuses on the formulation and evaluation of rosemary-infused soap as a natural alternative for daily hygiene applications.

## Materials and Methods

### Collection and Preparation of Plant Material

Dried rosemary (Rosmarinus officinalis L.) leaves were procured from a local herbal shop in Badlapur. A total of 30 g of dried rosemary leaves was accurately weighed for the preparation of the plant extract. The weighed dried rosemary leaves (30 g) were transferred into a heat-resistant glass beaker containing 300 ml of distilled water. The mixture was subjected to the double boiling method, where it was heated for 3 hours while maintaining a temperature range of 70–80°C. After cooling, the extract was filtered using a muslin cloth to remove plant residues. The required quantity of the filtered extract was used immediately for soap formulation.

### Formulation of Soap

| Sr No | Ingredients | Quantity |
|---|---|---|
| 1 | Glycerin | 50 g |
| 2 | Coconut oil | 10 ml |
| 3 | Shea butter | 10 g |
| 4 | Beeswax | 10 g |
| 5 | Essential oil | 2-3 drops |
| 7 | Rosemary extract | 20 ml |

**Table 1. Composition of rosemary-infused soap**

The mixture was heated gently with continuous stirring until a uniform consistency was obtained. The prepared solution was then poured into soap molds and allowed to set at room temperature for 6–7 hours. After completing solidification, the soap bars were carefully removed from the molds and stored in airtight containers until further evaluation.

**Figure 1. Rosemary-Infused soap after demolding from molds**

### Evaluation of Rosemary-Infused Soap

To assess the quality, safety, and effectiveness of the formulated rosemary-infused soap, various physicochemical, dermatological, and microbiological parameters were evaluated. These tests were

performed to determine the suitability of the soap for regular skin applications.

**Evaluation Methods**

**1. Physical Characteristics**

**1.1 Odour (Aroma):** The odour of the soap was evaluated by sensory analysis. Ten volunteers (male and female) were asked to smell the soap and record their perception of the aroma.

**1.2 Colour and Clarity:** The colour and clarity of the soap were assessed by visual observation against a white background to ensure accurate colour determination.

**1.3 Shape:** The physical shape and appearance of the soap were examined visually after completing solidification and unmolding.

**1.4 Dirt Dispersion Test:** The dirt dispersion property of the soap was evaluated using a patch test method, in which a small quantity of dirt was applied to the skin surface followed by washing with the soap to observe dirt removal efficiency.

**1.5 Skin Irritation (Patch Test):** A patch test was conducted to assess skin compatibility. The soap was applied to a small area of clean skin on volunteers and observed for redness, itching, burning sensation, or irritation after application.

**2. Chemical Characteristics**

**2.1 Determination of pH:** The pH of the soap was determined using pH indicator strips. A soap solution was prepared using distilled water, and the pH strip was immersed in the solution. The colour change was compared with the standard pH scale.

**2.2 Foaming Ability:** The foaming capacity of the soap was determined by the cylinder shaking method. Approximately 4 ml of soap solution was transferred into a 10 ml measuring cylinder and shaken vigorously for one minute. The height of foam formed above the liquid level was measured in centimeters.

**2.3 Foam Retention Time:** Foam stability was evaluated by observing the foam height at regular intervals after formation. The time taken for the foam to reduce significantly was recorded as the foam retention time.

**2.4 Microbiological Evaluation (Sterility Test):** To determine microbial contamination, a soap solution was prepared using sterile distilled water. The solution was T-streaked on a sterile nutrient agar plate under aseptic conditions and incubated at 37°C for 24 hours. The plate was observed for the presence or absence of microbial growth.

**Results and Discussion**

| Sr No | Parameters | Method | Observation |
|---|---|---|---|
| 1 | Odour | Sensory evaluation | Herbal/ Medicinal aroma |
| 2 | Colour | Visual observation | Brownish |
| 3 | Shape | Visual inspection | Circular shape |
| 4 | Skin irritation | Patch test method | No redness, itching or burning |
| 5 | pH | pH strip method | pH range: 8-9 |
| 6 | Foaming ability | Cylinder shaking method | Foam height: 7 cm |
| 7 | Foam retention | Time-based observation | Two minutes |
| 8 | Sterility testing | Streaking on nutrient agar | No microbial growth |

**Table 2. Assessment Parameters and Observations of Soap Formulation**

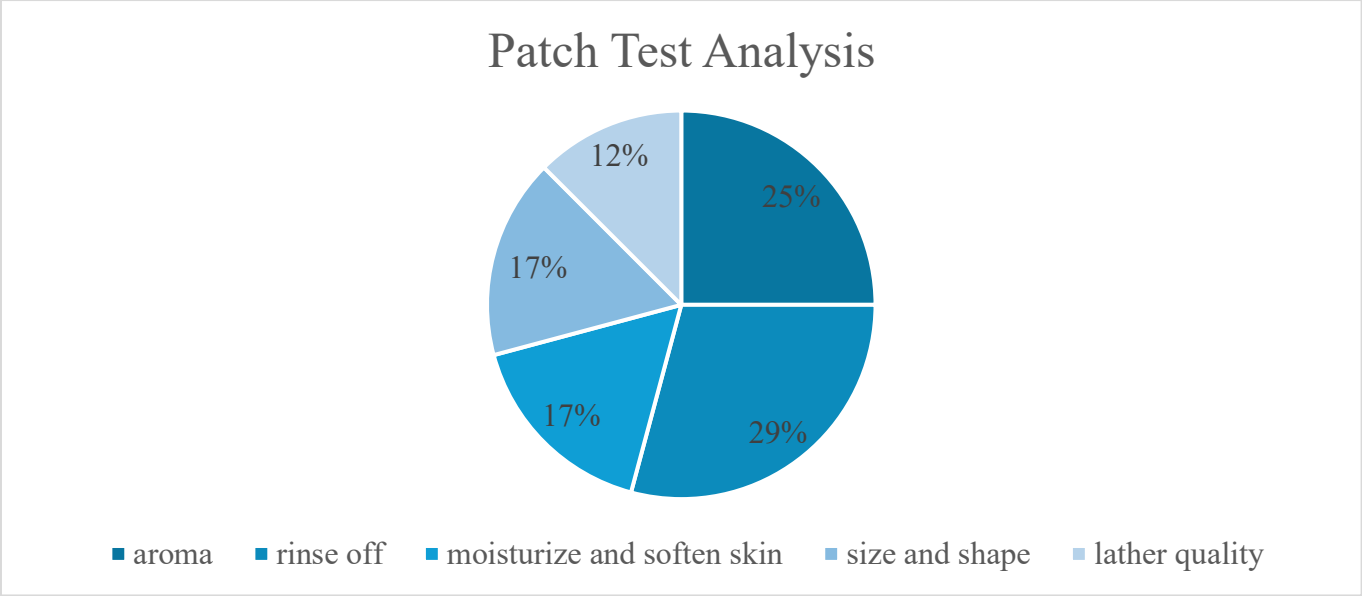


**Figure 2. Statistical data obtained after patch test on 10 volunteers**

Statistical analysis of soap involves the application of statistical techniques to understand the chemical and physical properties of soap. The moisture content, odour, hardness, colour, texture and some key properties of soap are analysed. Google form was created, and responses were collected from volunteers on which patch test was performed.

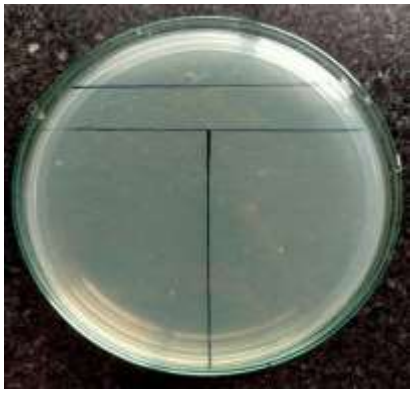

**Figure 3. Sterility test showing absence of microbial growth**

The rosemary-infused soap exhibited uniform colour, pleasant herbal aroma, and good physical appearance. Sensory evaluation and patch testing confirmed that the formulation was non-irritating and safe for skin application. The soap showed an acceptable pH range (8–9), good foaming ability, and satisfactory foam retention, indicating effective cleansing performance. Sterility testing revealed no microbial growth, confirming microbiological safety. These findings demonstrate that rosemary-infused soap is a safe, natural, and eco-friendly alternative to conventional soaps.

## Conclusion

The present work reports the successful formulation and evaluation of a rosemary-infused soap using natural ingredients. The prepared soap showed acceptable physicochemical properties, including suitable pH, good foaming ability, and satisfactory foam retention, indicating effective cleansing performance. Sensory evaluation revealed a pleasant herbal aroma, uniform appearance, and smooth texture. Patch testing confirmed that the soap was non-irritating and safe for topical application, while sterility testing indicated the absence of microbial contamination.

Overall, the rosemary-infused soap demonstrated good quality, safety, and user acceptability, suggesting its potential as a natural and eco-friendly alternative to synthetic soaps. The findings support the incorporation of herbal extracts like rosemary in skincare formulations. Further studies involving stability assessment and antimicrobial efficacy could enhance its scope for commercial applications.

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