

Formulation and Evaluation of Herbal Soap Using Neem, Tulsi, and Ritha Extracts

Mr. Rasane Somnath Arun¹, Mr. Bhalsing Mahesh Diliprao², Miss. Kale Rajeshri Avinash³, Miss. Telore Ashwini⁴, Miss. Nagargoje Pratiksha⁵

^{1,3}Lecturer, Pravara Medical Trust's College of Pharmacy, Shevgaon, Ahmednagar, MH, India

²Principal, Pravara Medical Trust's College of Pharmacy, Shevgaon, Ahmednagar, MH, India

^{4,5}Student, Pravara Medical Trust's College of Pharmacy, Shevgaon, Ahmednagar, MH, India

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ABSTRACT

Herbal soaps are gaining attention as safe and natural alternatives to conventional soaps. This study aimed to **formulate and evaluate a herbal soap using Neem (*Azadirachta indica*), Tulsi (*Ocimum tenuiflorum*), and Ritha (*Sapindus mukorossi*) extracts**. A vegetable-based, unscented soap base was used, enriched with **coconut oil and glycerin** for moisturizing, and **rose water and vitamin E** for fragrance and antioxidant protection. The soap was evaluated for **physical, chemical, functional, organoleptic, and biological properties**, including **pH, texture, lathering, foam stability, moisturizing effect, spreadability, stability, antimicrobial activity, and saponin content**. The formulated soap exhibited a **smooth appearance, firm texture, skin-friendly pH, effective foaming, moisturizing effect, and antimicrobial activity**. Stability studies confirmed no significant changes under room and accelerated conditions. The results demonstrate that the developed herbal soap is **safe, effective, and suitable for daily skincare**, providing a **natural and eco-friendly alternative to synthetic soaps**.

Keywords: Herbal soap, Neem, Tulsi, Ritha, Natural foaming, Antimicrobial, Cosmetic formulation

INTRODUCTION

Plants have been used for medicinal and cosmetic purposes since ancient times. The Greek philosopher **Theophrastus** classified plants into three major groups: trees, shrubs, and herbs, forming the foundation of botanical science. Over time, herbs have been extensively utilized for their therapeutic, nutritional, and cosmetic benefits. Herbal soaps are natural cleansing products formulated using plant-based ingredients that help maintain skin health and enhance its appearance.

The primary advantage of herbal soaps lies in their natural composition, which provides nourishment and protection to the skin without producing harmful side effects. Skin condition is influenced by several factors, including lifestyle, environmental exposure, personal hygiene, and overall health status. Prolonged exposure to heat and environmental pollutants often results in skin dehydration, leading to wrinkles, pigmentation, blemishes, and sunburn.

Most commercially available soaps contain synthetic chemicals, preservatives, and additives that may cause skin irritation and long-term adverse effects. Soaps and detergents, commonly used as disinfectants for daily hygiene, are available in various forms such as solid, liquid, semi-solid, and powder, and are intended to remove dirt, microorganisms, stains, and unpleasant odors. However, many commercial soaps may contain potentially harmful substances such as plastics, aluminum, mercury, barium, and bisphenol compounds, which can be absorbed through the skin and adversely affect human health.

According to **WHO mortality statistics, 17,857 deaths due to skin diseases were reported in India in 2020**, representing **0.21% of total deaths**. Incorporating herbal potentials into formulations offers a promising approach for management, providing effective treatment with improved safety and minimal adverse effects.³

In recent years, the use of herbal medicines and plant-based products has increased significantly worldwide. It is estimated that nearly 80% of the global population relies on herbal formulations for primary healthcare, particularly in developing countries. This growing interest has led to the emergence of **Herbal Medicinal Products** as an important field of pharmaceutical research, focusing on the development of safe, effective, and eco-friendly alternatives to synthetic cosmetic products.

The objective of this study was to **formulate a herbal soap combining these three plant extracts** and evaluate its **physical, chemical, functional, organoleptic, and biological properties**, ensuring safety, efficacy, and consumer acceptability.

MATERIALS AND METHODS

Collection of Neem Leaves of *Azadirachta indica* (Neem) were collected from Shevgaon, Maharashtra. The leaves were then shade-dried and coarsely powdered using a mortar and pestle.

Collection of Tulsi Leaves of *Ocimum tenuiflorum* (Tulsi) were collected from Shevgaon Maharashtra. The leaves were shade-dried and coarsely powdered using a mortar and pestle.

Collection of Ritha Seeds

Seeds of *Sapindus mukorossi* (Ritha) were collected from Shevgaon, Maharashtra. The seeds were shade-dried to remove moisture and then ground into a coarse powder using a mortar and pestle for further use in the study.

Extraction of Plant Materials for Herbal Soap Formulation

Extraction of *Azadirachta indica* (Neem) Leaves

Fresh leaves of *Azadirachta indica* were collected and washed thoroughly with distilled water to remove adhering dust and extraneous matter. The leaves were shade-dried at room temperature and then pulverized to obtain a coarse powder using a mortar and pestle. Accurately weighed **10 gm** of the powdered neem leaves were transferred into a conical flask containing **100 mL of distilled water**. The mixture was heated at a temperature of **65 °C for a period of 35 minutes** with occasional stirring, ensuring that vigorous boiling was avoided.

After completion of the heating process, the extract was allowed to cool to room temperature and was subsequently filtered through **muslin cloth followed by Whatman filter paper** to obtain a clear aqueous extract. The obtained filtrate was used directly for the preparation of herbal soap formulations. When necessary, the extract was gently concentrated to achieve the required consistency and strength.⁵



Figure 1: Collection of Neem Leaves (*Azadirachta indica*)

Extraction of *Ocimum tenuiflorum* (Tulsi) Leaves by Decoction Method

Fresh leaves of *Ocimum tenuiflorum* were collected, washed thoroughly with distilled water, and shade-dried for **15 days** until a constant weight was achieved. The dried leaves were coarsely powdered using a mortar and pestle.

An accurately weighed **5 g** of Tulsi leaf powder was transferred into a clean beaker, and **150 ml of distilled water** was added. The mixture was heated on a **water bath** and gently boiled until the volume was reduced to **one-third (50 ml)**.

The decoction was allowed to cool to room temperature and filtered through **muslin cloth followed by Whatman filter paper**. The filtrate was further concentrated on a **water bath maintained at 55°C** to obtain a thick aqueous extract. The extract was cooled in a **desiccator**, weighed, and stored in an **airtight container under refrigeration** until use.



Figure 2: Powder of Tulsi Leaves (*Ocimum tenuiflorum*)

Extraction of *Sapindus mukorossi* (Ritha) Pericarp by Decoction Method

Dried fruits of *Sapindus mukorossi* were collected, cleaned to remove dust and foreign matter, and the outer pericarp was separated and shade-dried. The dried pericarp was coarsely powdered using a mortar and pestle.

An accurately weighed **50 g** of Ritha pericarp powder was transferred into a clean beaker, and **500 ml of distilled water** was added with continuous stirring. The mixture was gently boiled on a **water bath/heating mantle** until the volume was reduced to **one-third (170 ml)**.

The decoction was allowed to cool to room temperature and filtered through **muslin cloth followed by Whatman filter paper**. The filtrate was further concentrated on a **water bath below 60°C** to obtain a thick aqueous extract rich in saponins. The extract was cooled in a **desiccator**, weighed, and stored in an **airtight container under refrigeration** until use in **herbal soap formulation**.

Formulation Table of Herbal soap:-

Sr. No.	Name of Ingredient	Quantity	Function
1	Aqueous Neem extract	25 ml	Provides antimicrobial and antibacterial activity; helps in cleansing the skin and preventing skin infections

2	Aqueous Tulsi extract	2.5 ml	Acts as an antioxidant and anti-inflammatory agent; soothes the skin and protects against microbial damage
3	Aqueous Ritha extract	25 ml	Rich in saponins; acts as a natural surfactant providing foaming, cleansing, and dirt-removal properties
4	Soap base (vegetable/oil-based, unscented)	100 g	Serves as the base matrix of the soap, providing structure, hardness, and basic cleansing action
5	Glycerine	10% w/w of soap base	Functions as a humectant; retains moisture and prevents dryness of the skin
6	Coconut oil	10 ml	Acts as an emollient; improves lather formation, enhances moisturizing effect, and prevents skin dryness
7	Rose water	2 ml	Imparts mild fragrance and provides skin-soothing and refreshing properties
8	Vitamin E (Tocopherol)	5 ml	Acts as an antioxidant; protects skin cells from oxidative damage and improves skin conditioning
9	Distilled water	q.s.	Used to adjust consistency and ensure uniform mixing of all ingredients

Table 1: Formulation Table with Detailed Functions



Figure 4: Melting of Soap Base on Water Bath

Preparation of Herbal Soap Using Neem, Tulsi, and Ritha Extracts

1. The soap base (100 g) was **cut into small pieces** and melted on a water bath at 50–55°C.
2. **Coconut oil (10 ml)** and **glycerin (10% w/w)** were added to enhance **emollient and moisturizing properties**.
3. The mixture was cooled slightly (<55°C) to **prevent degradation of thermolabile phytoconstituents**.

4. **Neem extract (25 ml)** was added gradually, followed by **Ritha extract (25 ml)** and **Tulsi extract (2.5 ml)**, ensuring uniform dispersion.
5. **Vitamin E (5 ml)** and **rose water (2 ml)** were added for **antioxidant protection and fragrance**.
6. Distilled water was added to **adjust the consistency**.
7. The mixture was stirred gently, poured into molds, and **allowed to solidify at room temperature for 24 hours**.
8. Soap bars were **demolded, wrapped, and stored in airtight containers** for evaluation.



Figure 5: Neem, Tulsi and Ritha of Herbal Extracts



Figure 6: Pouring into Moulds



Figure 7: Final Prepared Herbal Soap Bars

Evaluation Parameter of Herbal soap:-

Table 2: Evaluation Parameters, Detailed Procedures, Observation and Remarks

Sr. No.	Parameter	Method / Procedure	Standard Reference Value	Observation	Remark
1	Organoleptic (color, appearance, fragrance, texture)	Visual inspection and touch test by panel of 5–10 evaluators	Uniform color, pleasant fragrance, smooth texture	Uniform color, pleasant fragrance, smooth texture	Good
2	pH	1 g soap dissolved in 10 ml distilled water, measured with pH meter	5.5–8	7.2	Good
3	Appearance & Color	Visual inspection under natural light	Smooth surface, uniform color, no cracks	Smooth surface, uniform color	Good
4	Texture / Hardness	Manual press test / texture analyzer	Firm, not brittle	Firm, easy to handle	Good
5	Foaming / Lathering Ability	1 g soap in 50 ml water, shaken for 1 min	Good foam formation	Good lather formed	Good
6	Foam Stability	Foam allowed to stand for 5–10 min; volume observed	Foam persists \geq 5 min	Foam persisted 6–8 min	Good
7	Moisturizing Effect	Skin application / in-vitro moisture retention	Soft, hydrated skin	Skin felt soft and hydrated	Good

8	Solubility / Dissolution Rate	1 g soap in 50 ml water, time recorded	Dissolves in 2–3 min	Dissolved easily within 2 min	Good
9	Spreadability	Applied on skin / glass surface	Uniform coverage	Even coverage observed	Good
10	Stability / Shelf-life	Stored at room temp & accelerated conditions for 1–3 months	No color, odor, or texture changes	No color change, odor or texture change	Good
11	Antimicrobial Activity	Agar well diffusion method against <i>S. aureus</i> , <i>E. coli</i> , <i>C. albicans</i>	Zone of inhibition ≥ 10 mm	Clear zone of inhibition observed	Good
12	Total Saponin Content	Gravimetric / spectrophotometric method	$\geq 5\%$ (sufficient for foaming)	Saponin content sufficient for foaming	Good

DISCUSSION

The present study successfully formulated a herbal soap using **Neem (*Azadirachta indica*)**, **Tulsi (*Ocimum tenuiflorum*)**, and **Ritha (*Sapindus mukorossi*) extracts**, combining therapeutic benefits with cosmetic functionality. The soap was prepared using a vegetable-based, unscented soap base, with **coconut oil and glycerin** for emollient and moisturizing effects, and **rose water and vitamin E** for fragrance and antioxidant protection.

The selected extracts contributed **antimicrobial, antioxidant, and foaming properties**, with Neem and Tulsi providing broad-spectrum antibacterial activity and Ritha ensuring natural foaming due to its saponin content. The extracts were incorporated at optimized concentrations to maintain efficacy while ensuring compatibility with the soap base.

Evaluation revealed a **smooth, uniform appearance**, firm but manageable texture, and a **skin-friendly pH (7.2)**. The soap demonstrated **good lathering, foam stability, solubility, spreadability, and moisturizing effects**, confirming its cleansing efficiency and user acceptability. **Organoleptic assessment** indicated pleasant fragrance and smooth feel. **Stability studies** under room and accelerated conditions showed no significant changes, and antimicrobial testing confirmed the bioactive potential of the herbal extracts. Total saponin content validated Ritha's contribution to foaming.

Overall, the formulated soap exhibited **excellent physical, chemical, functional, and sensory properties**, making it suitable for **daily skincare**. These findings support the development of **herbal cosmetic products as safe, natural alternatives** to conventional soaps and provide a basis for further commercial application.

CONCLUSION

The study successfully formulated a **herbal soap** incorporating **Neem (*Azadirachta indica*)**, **Tulsi (*Ocimum tenuiflorum*)**, and **Ritha (*Sapindus mukorossi*) extracts**, which provided **antimicrobial, antioxidant, and natural foaming properties**. The soap exhibited **good physical characteristics** (smooth appearance, uniform color, firm texture), **skin-friendly pH**, and **effective moisturizing, lathering, and spreadability**, making it suitable for daily use.

Organoleptic evaluation confirmed pleasant fragrance and smooth feel, while **stability studies** showed no significant changes under room and accelerated conditions, indicating **physical and chemical stability**. **Antimicrobial testing** validated the bioactive potential of Neem and Tulsi extracts, and **total saponin content** confirmed Ritha's role in natural cleansing and foaming.

Overall, the formulated herbal soap is **safe, effective, and consumer-friendly**, providing a **natural alternative to conventional soaps**. This research supports the potential **commercial development of herbal cosmetic products** that combine therapeutic benefits with aesthetic appeal.

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