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Formulation and Evaluation of a Natural Antibacterial Polyherbal Soap for Enhanced Skin Health

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Abstract

In response to increasing demand from consumers for safe, environmentally sustainable, and skin-friendly personal care products, this study sought to develop and test a natural polyherbal soap meant to improve skin health. The formulation combines plant-based components such as mango (*Mangifera indica*), teak (*Tectona grandis*), almond (*Prunus amygdalus*), and neem (*Azadirachta indica*) leaf extracts with rosewater and a gentle soap base. These herbs were chosen for their well-established antibacterial, antioxidant, and skin-nourishing qualities. The soap was created utilizing the important physicochemical parameters as pH, foaming ability, hardness, and moisture content. The developed polyherbal soap has good physical properties and efficient antibacterial action. It also had a skin-friendly pH and produced no negative reactions during preliminary dermatological testing. The findings indicate that this polyherbal soap is a promising natural alternative to standard antibacterial soaps, promoting both skin hygiene and wellness.

Keywords: Antimicrobial, Antibacterial, Formulation, Polyherbal, Antioxidant

1. Introduction

Skin is the largest organ in the human body and serves as the first line of defense against environmental contaminants, infections, and physical harm.¹ As people become more aware of the detrimental consequences of synthetic compounds contained in traditional skincare products, there is a growing need for natural and herbal alternatives that are both safe and effective.^{2,3} traditional medicinal plants including mango, teak, almond, and neem have been recognized for their therapeutic characteristics and are extensively utilized in numerous cultures to treat skin ailments.⁴ This study intends to produce a multipurpose soap by using mango, teak, neem, and almond. Each of these ingredients has unique bioactive qualities that contribute to herbal soap.⁵

Mango leaves offer antibacterial characteristics, which contribute to skin protection. Teak leaves have antibacterial and anti-inflammatory properties; almond leaves have hydrating properties; and neem leaves

have antiseptic and antifungal properties.⁶

The rationale for combining these specific ingredients is in their synergetic capacity to increase cleanliness and skin regeneration by making a soap that gives benefit of these herbal extracts.⁷ We want to provide an effective, moisturizing, silky soap for all purposes. This research will explore the preparation methods of multipurpose soap, evaluate its potential benefit based on the properties of each ingredient, and discuss safety considerations such as usage and potential adverse effects.⁸ We will also highlight the importance of quality control and sourcing of herbal ingredients to ensure the safety and efficacy of the product.⁹

The current work focuses on the formulation and assessment of a natural antibacterial polyherbal soap made with extracts from mango (*Mangifera indica*), teak (*Tectona grandis*), almond (*Prunus amygdalus*), and neem (*Azadirachta indica*) leaves, rosewater, and a natural soap base.¹⁰ These ingredients were chosen for their traditional use in skincare, as well as their scientifically proven antibacterial and skin-protective characteristics.¹¹ The purpose of this study is to develop a mild, effective, and eco-friendly soap formulation that promotes skin health.¹²⁻¹⁴

2. Material for Polyherbal Soap

2.1 Mango leaves extract:¹⁵

- Kingdom: Plantae
- Division: Magnoliophyta (also called Angiosperms)
- Class: Magnoliopsida (Dicotyledons)
- Subclass: Rosidae
- Order: Sapindales
- Family: Anacardiaceae
- Genus: *Mangifera*
- Species: *Mangifera indica*

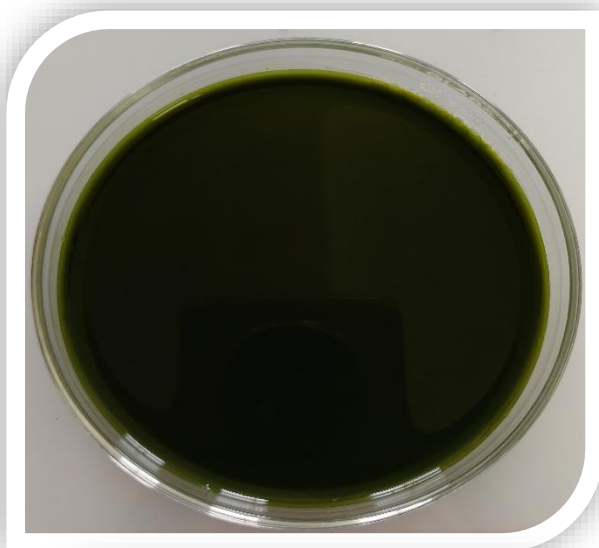
Figure 1: No. 1 Mango leaves extract



2.2 Almond leaves extract¹⁶

- Kingdom: Plantae
- Division: Magnoliophyta (Angiosperms)
- Class: Magnoliopsida (Dicotyledons)
- Subclass: Rosidae
- Order: Rosales
- Family: Rosaceae
- Genus: Prunus
- Species: Prunus dulcis

Figure 2: Almond leaves extract



2.3 Teak leaves extract¹⁷

- Kingdom: Plantae
- Division: Magnoliophyta (Angiosperms)
- Class: Magnoliopsida (Dicotyledons)
- Subclass: Asteridae
- Order: Lamiales
- Family: Lamiaceae (formerly placed in Verbenaceae)
- Genus: Tectona
- Species: Tectona grandis

Figure 3: Teak leaves extract



2.4 Neem leaves extract¹⁸

- Kingdom: Plantae
- Division: Magnoliophyta
(Angiosperms)
- Class: Magnoliopsida
(Dicotyledons)
- Subclass: Rosidae
- Order: Sapindales
- Family: Meliaceae
- Genus: Azadirachta
- Species: Azadirachta indica



Figure 4: Neem leaves extract

2.5 Rose glycerin soap base¹⁹

- A glycerin rose soap base typically refers to a melt-and-pour soap base made with glycerin (a moisturizing agent) and rose extract.

➤ **Uses:**

- Gentle on skin
- Hydrating due to glycerin.
- Pleasant natural fragrance
- Can be used for sensitive or dry skin.



Figure 5: Rose glycerin soap base.

3. Formulation Profile of Polyherbal Soap

Table 1: Ingredients Profile

Sr No.	Ingredients	Quantity
1.	Mango leaves extract	10 ml
2.	Almond leaves extract	10 ml
3.	Teak leaves extract	10 ml
4.	Neem leaves extract	08 ml
5.	Rose glycerin soap base	30 gm
6.	Rose water	2 ml

4. Procedure of Polyherbal Soap Preparation

4.1 Collection and weighing raw material

- Collect and weight of all ingredients like Mango leaves extract, almond leaves extract, teak leaves extract, neem leaves extract, rose water, rose glycerin soap base.

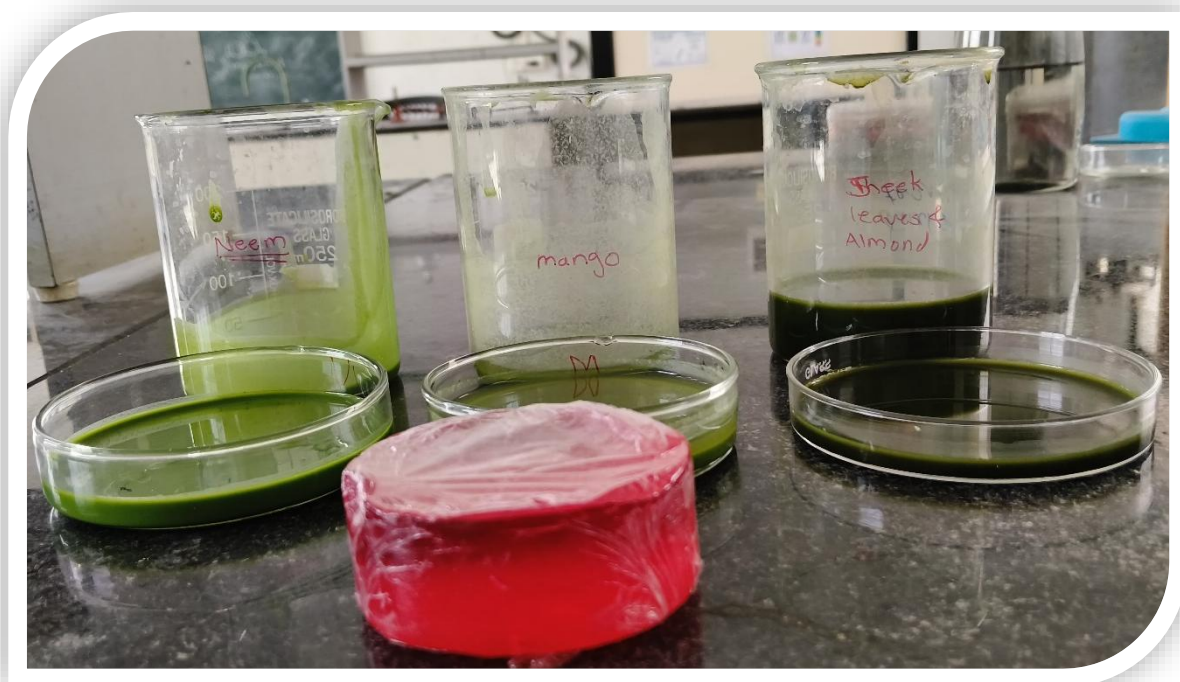


Figure 6: Collection and weighing raw material

4.2 Preparing the Rose glycerin soap base

- The glycerin base was cut into the small piece and then put into the pot for double boiling method and heat the glycerin cubes until its completing rose glycerin soap.

Figure 7: Preparing the Rose glycerin soap base.



4.3 Adding of raw material

- After glycerin cubes is completely melt, then add remaining ingredients and stir it.



Figure 8: Addition of raw material

4.4 Pouring

- Once desired consistency is occurred then the solution is poured into the molds.



Figure 9: Pouring of sample.

4.5 Cooling

- The molds are kept at room temperature for 30 minutes then remove soap from molds.
- Finally, Soap is formed.

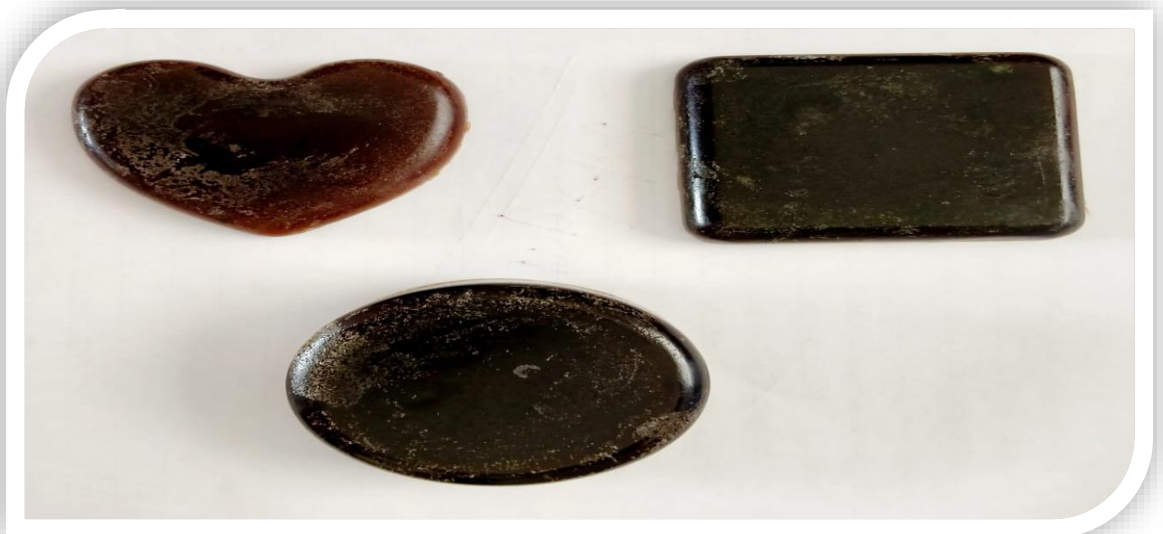


Figure 10: Soap is ready.

5. Physical Evaluation Parameter and Results of Polyherbal Soap²⁰

The following physical parameters have been studied for the formulation of Polyherbal Soap. Color, odor, and appearance. texture, Ph, homogeneity, stability, consistency, spreadable capacity, Foamability and Smoothness, skin irritancy, consistency, weight of soap.

Table 2: Physical Evaluation Parameter Polyherbal Soap.

Sr No.	Parameters	F1	F2	F3
1.	Colour	Greenish black	Greenish black	Greenish black
2.	Oduor	Fragrant	Fragrant	Fragrant
3.	Appearance/shape	Heart	Rectangle	Ovule
4.	Texture	Smooth	Smooth	Smooth
5.	pH	8.3	8.2	8.2
6.	Skin Irritancy test	No Irritation	No Irritation	No Irritation
7.	Stability	1 month stable	1 month stable	1 month stable
8.	Consistency	Semisolid	Semisolid	Semisolid
9.	Weight determination	61 gm	60 gm	61 gm
10.	Spreadable	Uniform	Uniform	Uniform
11.	Washing capability	Easily washable	Easily washable	Easily washable
12.	Solubility	Soluble	Soluble	Soluble

6. Weight test of Polyherbal Soap



Figure 11: Weight of polyherbal soap.

7. Why use these ingredients

- Neem (*Azadirachta indica*): Strong antimicrobial and antifungal properties.
- Mango Leaves (*Mangifera indica*): Rich in antioxidants and soothing agents.
- Teak Leaves (*Tectona grandis*): Known for wound healing and anti-inflammatory properties.
- Almond Leaves (*Prunus dulcis*): Contains tannins and antioxidants; helps with skin toning.

8. Discussion

The present work is concerned with the formulation of polyherbal soap using Mango leaves extract, almond leaves extract, teak leaves extract, neem leaves extract, rose water, rose glycerin soap base. the formulated polyherbal soap was a dry, good appearance and is foamy in nature. it showed good skin compatibility and it proved that it does not irritate the skin, and it produced satisfactory results.

9. Conclusion

The current study successfully formulated a polyherbal soap that included mango, almond, teak, and neem leaf extracts, as well as rose water and a rose glycerin soap base. The combination of these natural substances has demonstrated remarkable cleaning and antibacterial capabilities, which are attributable to bioactive chemicals found in plant extracts. The soap had desirable physical properties such as good lathering, a pleasant aroma, and a skin-friendly texture, making it appropriate for regular usage. This composition not

only provides a natural alternative to chemical-based soaps, but it also utilizes the therapeutic properties of traditional medicinal plants. Microbiological testing, stability analysis, and user acceptability trials may be performed in the future to further evaluate its efficacy and economic potential. The most promising research in this study is that the polyherbal soap is chemical-free. This composition is compatible with all skin types and has no irritant effects. The results also indicate that the polyherbal soap produced is appropriate for human skin.

10. Conflict of Interests

- The authors declare that they have no known competing financial interests or personal relationship that could have appeared to influence the work reported in this paper.

11. Acknowledgment

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