

# FORMULATION AND EVALUATION OF ANTI-MICROBIAL HERBAL SOAP

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## **Abstract:**

Herbal soaps, often known as natural soaps, are made from plant-based ingredients and botanical extracts. Herbal soap was formulated using leaf of *azadirachta indica*, *Ocimum tenuiflorum*. They offer the skin several advantages since they are made of natural ingredients. Their inherent aroma, antioxidant content, nourishing and moisturizing attributes, and environmental friendliness are a few of the benefits. The preparation of the extracts of the herbal soap is based on herbal formulation and evaluation including organoleptic and physiochemical parameters determination. The pH, foam height, foam retention were measured and observed. The colour and odour was observed to be greenish, smooth in texture and aromatic odour. Our study's objectives is to create herbal soap through the cold method. Aloevera, tulsi, neem, vitamin E, Rice water were used to make herbal soap. Using varying concentration of the soap solution in comparison to a standard, the herbal formulation was created and assessed for the measurement of pH, foaming height, foam retention duration, thermal stability, consistency.

## **Keywords:**

Azadirachta Indica, aloe, *ocimum tenuiflorum*, antioxidant, vitamin E, antimicrobial

## **Introduction:**

Soap is a mixture of sodium salts of various naturally occurring fatty acids. If the fatty acid salt has potassium rather than sodium, a softer lather is the result. Soap is produced by saponification or basic hydrolysis reaction of a fat or oil. Most commercial soaps contain chemicals that can be harmful to the skin and using a natural herbal soap can be a good alternative. Herbal soaps are made using natural herbs and ingredients that are healthier and beneficial for the skin and are less likely to cause any damaging effect. Some of the natural soap manufacturers also use aromatherapy and herbal treatment to offer the best skin treatment solution for your skin. Made of rare herbs and 100% natural ingredients, herbal soaps are found to be highly beneficial for the skin. The herbs infused in these soaps have therapeutic and healing characteristics that offer specific benefits to the skin, such as nourishment, strength, healing and moisturizing. These soaps also contain super fatty oils, vitamin E, aloe and essential oils that are allied to the goodness of skin and overall health herbal soaps are also effective curing different skin complaints. These soaps also contain glycerin, which is generally not used in

commercial soaps. Glycerin helps in retaining the moisture in the skin thereby making these soaps for dry skin condition. Herbal soap preparation are medicines or drugs which contain anti-bacterial, anti-fungal agents which mainly used parts of plants such as leaves, stem, roots and fruits for treatment for an injury or disease or to achieve good. These preparations possess antimicrobial properties and are administered topically and available to apply in various forms like creams, gels, soaps, solvent extracts or ointment. In the present study azadirachta indica and ocimum tenuiflorum oils were used to prepare the anti-bacterial herbal soaps and their physicochemical characteristics were evaluated.

The human skin is the body's major organ and serves as the first line of defense. Increasingly, natural plant-based medications are favored for their benefits, such as fewer adverse reactions, better patient endurance, lower costs, and historical acceptance. Soap is a mixture of sodium salts of various naturally occurring fatty acids. If the fatty acid salt has potassium rather than sodium, a softer lather is the result. Soap is produced by saponification or basic hydrolysis reaction of a fat or oil. Most commercial soaps contain chemicals that can be harmful to the skin and using a natural herbal soap can be a good alternative. Herbal soaps are made using natural herbs and ingredients that are healthier and beneficial for the skin and are less likely to cause any damaging effect. Herbal soap preparations are medicines or drugs which contain anti-bacterial & antifungal agents which mainly uses parts of plants such as like leaves, stem, roots & fruits for treatment for an injury or disease or to achieve good health. These preparations possess anti-microbial properties and are administered topically and available to apply in various forms like creams, gels, soaps, solvent extracts, or ointments<sup>3</sup>. In the present study, Azadirachta indica and Ocimum tenuiflorum oils were used to prepare the anti-bacterial herbal soaps and their physicochemical characteristics were evaluated. The use of a natural soap base ensures that the final product remains gentle and suitable for daily use. Herbal soaps offer therapeutic benefits by combining the cleansing properties of conventional soaps with the medicinal effects of plant-based ingredients. The present study focuses on the formulation and characterization of a herbal neem soap, evaluating its physicochemical properties and antimicrobial efficacy to develop a safe, effective, and sustainable personal care product. The demand for herbal and natural personal care products has witnessed a significant rise globally in recent years. This growing trend is primarily driven by increasing consumer awareness regarding the potential adverse effects of synthetic chemicals used in conventional cosmetics and toiletries, including skin irritation, allergic reactions, and long-term environmental consequences. As a result, there is a heightened interest in the development of herbal alternatives that are not only safe and skin-compatible but also environmentally sustainable. The present study involves the formulation and evaluation of a polyherbal soap containing extracts from Neem (*Azadirachta indica*), Tulsi (*Ocimum tenuiflorum*), and Aloe vera (*Aloe barbadensis* Miller)—three medicinal plants renowned for their traditional and scientific relevance in dermatological care. A soap is defined as a combination of fatty acid salts for cleaning the body, formed through the saponification of triglyceride fats with alkali. Chemically synthesized soaps often contain harmful

substances like mercury and phenol, which can damage the skin and other organs. This has led to the development of herbal products, known for their minimal side effects, drawing on traditional practices in India for disease treatment through herbal medicine.

Common causes of skin infections are the invasion of the skin by pathogenic microorganisms. So, any substance with antimicrobial properties, which either kills the microorganism or inhibits the growth of the micro-organism is essential for treating skin infections. The quality of soap is determined by its physicochemical properties, which define soap's efficiency and cleansing properties. The physicochemical characteristic of soap depends on the strength and purity of alkali, the kind of oil used, and the completeness of saponification. Such physicochemical characteristics include moisture content, TFM, pH, free caustic alkalinity, and percentage chloride. Many herbal soaps in the market today have a long history of their efficacy toward various skin diseases, most especially pathogens such as fungal and *Staphylococcus aureus* and other streptococcus species.

### **The different type of skin:**

A. Normal Skin: A balanced skin type features adequate oil and moisture, smooth and soft texture, small pores, and requires only basic skincare for maintenance.

B. Dry Skin: Dry skin is characterized by low sebum production, resulting in a rough, flaky, or dull appearance and a tight feeling after cleansing. It is prone to fine lines, irritation, and sensitivity, necessitating hydration, moisturization, and protection against environmental damage.

C. Oily Skin: The oily skin, characterized by excessive sebum production, results in a shiny and greasy appearance, particularly in the T-zone. It often features enlarged pores and is more susceptible to acne, blackheads, and breakouts, requiring oil control, deep cleansing, and the use of non-comedogenic skincare products.

D. Combination Skin: Individuals with combination skin exhibit oily characteristics in the T-zone, while areas like the cheeks and jawline may be dry or normal. This skin type necessitates a balanced skincare routine that addresses both oil control and moisturization.



**Fig No.1: Dry skin****Fig no. 2: Oily skin****Various type of herbal soap:**

A. Combination 1: Polyherbal soap is formulated using cassia fistula, ficus religiosa, and millettia pinnata, targeting antimicrobial properties for nosocomial infections. The formulation includes leaf extracts, melted basic glycerin soap, methanol, stearic acid, cinnamon oil, and cinnamom oil, which are mixed and allowed to solidify before undergoing various evaluations.

B. Combination 2: In this combination the plants used are H. Indicus (aanatamool), slappa (kushta), C. rotundus (mustaka). Three oils were taken and they are coconut oil, palm oil, and castor oil was added. Then the lye solution was added and mixed and then three sample extract was added and heated and then it allowed to solidify and then various parameters were carried out. It is an ayurvedic herbal soap and it has tyrosinase inhibiting property.

C. Combination 3: Curcuma longa, azadirachta indica, allium sativum, by taking these three plants the polyherbal soap is formulated. The three plant samples were extracted. The basic glycerine soap was taken and it is melted and then the sample extracts are added and then ethanol is added and stearic acid is added and almond oil is added and then it is allowed to solidify and parameters are checked. Then the antimicrobial activity is carried out in the organism of staphylococcus aureus. This soap is used as an antibacterial soap.

D. Combination 4: The polyherbal is formulated using azadirachta indica, ocimum tenuiflorum and sapindus mukorossi. These three powder extracts were incorporated into soap formulated with basic glycerine soap taken and then it is melted and the extract was incorporated into the melted solution and allowed to solidify and then the soap is formed and then pH is checked and the antimicrobial assay is carried out and there is a presence of zone of inhibition.

E. Combination 5: The combination of vetiveria zizanioides, vitex negundo, neem, tulsi formulates the polyherbal soap. This was used for the skin wellness. The samples were powdered and it is mixed with liquid NaOH and then the coconut oil is mixed with extract powder and filtered and then the filtered oil is added in the NaOH solution and then it is allowed to solidify and then the antibacterial assay is carried out and characteristics are observed and there is presence of zone inhibited and various parameters are carried out.

**Types of soap:** There are several types of soap available in the market.

**Classification of soap:**

1 Based on usage: -

- |                    |                     |
|--------------------|---------------------|
| 1. Toilet soap     | 3. Glycerin soap    |
| 2. Non-toilet soap | 4. Transparent soap |

2 Based on form: -

1. Handmade soap

2. Bar soap

3 Based on ingredients: -

- |                  |                |
|------------------|----------------|
| 1. Flavored soap | 4. Luxury soap |
| 2. Milk soap     | 5. Perfume     |
| 3. Animal soap   |                |

4 Based on method of manufacture: -

- Melt and pour method
- Hot press method and cold press method
- Milling method


**Advantages**





- They do not cause allergic reaction and do not have negative side effects.
- They are easily incorporated with skin and hair.
- With a small quantity, they are very effective compared to synthetic soap.
- Extract of the plant decreases the bulk property of cosmetics and gives an appropriate pharmacological effect.
- Easily available and found in a large variety and quantity.
- Easy to manufacture.
- Cheap in cost.

**Disadvantages**

- Soaps are not suitable in hard water.
- They have weaker cleaning properties than detergent.

**Table. No.1** Drug profile

Drug name	Botanical name	Common name	Kingdom	Family	Species	Scientific name	Uses
Neem	Azadirachta indica, Margosa	Nimba	Plantae	Meliaceae 	Azadirachta indica	Azadirachta indica	Antbacterial, Anti-inflammatory

Aloevera	Aloe barbadensis	Korphad	Plantae	Asphodelaceae 	A. vera	Aloebarbadensis miller	Anti-microbial
Rice water	Oryza sativa	Maad or kanji	Plantae	Poaceae 	sativa	Oryza sativa	Acne treatment
Tulsi oil	Ocimum Sanctum (L)	Holy basil oil	Plantae	Lamiaceae 	Ocimum tenuiflorum	Ocimum tenuiflorum	Anti-inflammatory
Vitamin E	Tocopherol	-	Vital		-	Tocotrienol	Anti-oxidant

**Material and method:**

**Ingredients:**

- |               |        |             |
|---------------|--------|-------------|
| 1.            | base N |             |
| eem powder    | 4.     | Tulsi oil   |
| 2.            | 5. A   | Vitamin E   |
| loevera       | 6.     | Rice water  |
| 3.            | 7. G   | Citric acid |
| lycerine soap |        |             |

**Apparatus:**

- |                  |              |                  |
|------------------|--------------|------------------|
| 1.               | 4B           | 7G               |
| eaker            | lass rod     | urner            |
| 2.               | 5C           | 8M               |
| hina dish        | ixer/grinder | ortal and pestle |
| 3.               | 6M           | C                |
| asuring cylinder | onical flask |                  |

**Instruments:**

- |         |          |        |          |
|---------|----------|--------|----------|
| 1.      | Weighing | 3.     | pH meter |
| balance |          | 4.     | Heating  |
| 2.      | Mixer    | mental |          |

**Method:**

1. Collection of leaves: - Leaves of azadirachta indica were collected from the tree.
2. Cleaning of leaves: - Leaves were gently wash by using distilled water.
3. Drying: - Dry by using sun drying method.



**Fig no. 3:** Collection of leaves and drying

**Preparation of powder:**

1. Took a leave of neem plant.
2. Dried with the help of sunlight.
3. After completing dry them.
4. Grind them with the help of a grinder/mixer.
5. After grinding used the neem powder for the soap.



**Fig. no 3:-** Preparation of powder

**Table no 2.** Ingredient table

Sr. no	Ingredients	Quantity
1	Neem powder	6g
2	Aloe	2ml
3	Vitamin E	1ml

4	Rice water	2ml
5	Citric acid	1g
6	Glycerin soap base	35g
7	Tulsi oil	2ml

#### Formulation of herbal soap:

1. Weigh all the ingredients which is solid using a weighing balance
2. Take a glycerin soap base in container and melt it using heating mental
3. After melting the soap base, add neem powder in the solution
4. Then add rice water, aloe, citric acid, and mix the solution
5. Then finally heat stop and add tulsi oil
6. The prepared solution will be give in small mold for the shape of the soap
7. The final herbal soap is ready



**Fig no. 4:** Preparation of soap

#### Evaluation test of herbal soap:

The following is the evaluation parameter for the herbal soap:

1. Physical appearance
2. Thermal stability
3. Determination of pH
4. Microbial growth
5. Foaming ability
6. Consistency
7. Foam retention

1. Physical appearance: The prepared formulation of soap was evaluated in terms of clarity. The prepared soap shows greenish colour.

2. Thermal stability: The thermal stability of the formation was determined by the humidity chamber controlled at 60-70 /RH at room temperature. The soap mainly stable at room temperature.
3. Determination of pH: 5 to 6g of the soap was weighted accurately in a 100ml beaker 40ml water was added and dispersed the soap in it. The pH of solution is determined by pH meter. The of the soap is 8.2.
4. Microbial growth: Using agar plates, the plates were placed in the incubator and incubator at 37°c for 24 hours and compared with the standard.
5. Foaming Ability: Foaming ability was determined by using the cylinder shake method. Bristle 40ml of the formulation soap solution was placed graduated cylinder. It was covered with the hand and shaken for 10 times. The total volume of the foam content after 1min of shaking was recovered foam stability was evaluated by recording the foam volume after min and 4min 50 to 93% foam formed.
6. Consistency: The consistency of a formulated soap was determined by hand. Take pinch of soap and rub it with your finger.
7. Foam retention: About 1% soap solution was prepared , and from this, 25ml was taken in a 100ml measuring cylinder. The cylinder was covered with a hand and shaken for 10 min. The volume of format 1min interval for 5min recorded.

**Table no.3:** Observation table

Evaluation parameters	Observation
Physical appearance	Greenish colour
Thermal stability	Stable at room temperature Soap melt at 60°c
Determination of pH	8.2
Stability studies	No colour change
Microbial growth	No microbial growth
Foaming stability	Stable soap
Foaming retention	1.6cm



**Fig. no 5:** Final product soap

### **Discussion:**

The evaluation of anti-microbial herbal soap was formulated successfully and tabulated. The physicochemical parameter for herbal soap formulation, such as colour, appearance, pH were determined. The prepared soap shows greenish colour. Herbal soap was formulated by using above method. A collection recommended procedure steps for assessing the identity, purity and content of herbal medicine to develop potent antiseptic herbal soap. The chemically made soap gives some side effects to the human body. The herbal soap has fewer side effect as compared to the chemical soap. It also act as a anti-bacterial and anti-microbial soap.

### **Conclusion:**

In the present work, antimicrobial herbal soaps were prepared with suitable size and shape, thickness, weight, and with good foam producing ability. Herbal soaps of neem and aloe vera were prepared for their anti-bacterial activity for the treatment of pimples, acne and scars. Soap were prepared by cold press method and the formulation were characterized for different evaluation parameter like clarity, colour, odour, size and shape, thickness, weight and pH in which they exhibited satisfactory results. The herbal soap shows good appearance with greenish colorant with a pleasant aromatic smell and showed good anti-bacterial properties. Based on the study, it can be concluded that herbal products can be effectively formulated in the form of medicated herbal soaps by using the cold press technique with excellent antibacterial properties.

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