

**FORMULATION AND EVALUATION OF ANTIFUNGAL  
POLYHERBAL SOAP**

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**ABSTRACT**

Medicinal herbs have been used as a form of medicine since ancient times. As a natural cure, the extract from numerous medicinal plants' leaves, stems, and roots has been used to treat various diseases and disorders. One example is the formulation of herbal soap, which is used both for treating microbiological diseases and for daily use. Most of the commercial soaps contain chemicals that can harm the skin. The use of natural herbal soap can be a good alternative. Antifungal soap is a type of soap that helps individuals treat a variety of fungal conditions. This type of soap is typically effective against an athlete's foot and jock itch. It may also help cure non-fungal skin disorders like psoriasis and eczema. Many antifungal soaps are highly safe because they contain natural ingredients. The present study aims to formulate an herbal soap containing *Cyandon dactylon* and *Aegle marmelose*.

Soap contains *Cynodon dactylon* extract, *Aegle marmelos* extract Vitamin C (Ascorbic acid), SLS, Vitamin E, Turmeric, Lavender essential oil, Rose water, Distilled water. The prepared soap was evaluated by parameters like organoleptic evaluation, appearance, homogeneity, skin irritation test, pH, moisture content, foam height, foam retention, and TFM compared with standard marketed soap. The easy availability of plants and their effectiveness help manufacturers with cost-effective benefits and with fewer or no side effects. The advantage of this antifungal soap of *Cyandon dactylon* and *Aegle marmelose* is to treat fungal infections.

**KEYWORDS:** *Cyandon dactylon*, *Aegle marmelose*, fungal infection, polyherbal, soap, formulation, antifungal soap.

## INTRODUCTION

Soap is made by combining sodium salts of different naturally occurring fat acids. If a fatty acid salt contains potassium instead of sodium, the lather is softer. A fatty acid or oil is saponified or undergoes a basic hydrolysis process, to produce soap.<sup>[1]</sup>

Most synthetic soaps contain chemicals that are harmful to your skin, so using a natural herbal soap is an excellent alternative. Herbal soap is made with natural herbs and natural ingredients that are healthier and good for your skin and less likely to cause any harm. Some natural soap.

Manufacturers use herbal and aromatherapy treatments to provide you with the best possible skin treatment solution. Herbal soap preparations are medicines or treatments that contain antibacterial and antifungal substances derived mostly from plant components such as leaves, stems, roots, and fruits. They are used to treat damage or disease or to promote good health. Herbal soaps are made of 100% natural ingredients that are infused with rare herbs and have therapeutic and healing properties that offer special benefits to the skin. These soaps contain nourishing, powerful healing, moisturizing herbs, super fatty oils, vitamin E, aloe, and essential oils that are beneficial to your skin and overall health.<sup>[2]</sup>

Herbal soaps are effective in treating various skin complaints. They also contain glycerine, which is not usually found in commercial soaps, which helps in retaining moisture in the skin. These products are applied topically and can be in a variety of formulations, including cream, gel, soap, solvent extract, and ointment. In this study, we prepared soap using two different herbs: *Cyandon Dactylon*, and *Aegle Marmelose*, and their physicochemical properties were evaluated.<sup>[3]</sup>

Fungal infections cause a significant risk to public health. Fungal infections are linked to fatal mycoses and a higher risk of death in individuals with COVID-19 and other disorders. Fungi can cause infections of various severity levels, such as superficial, cutaneous, subcutaneous, mucosal, and systemic. Human microbiota includes organisms like *Candida* spp. that can lead to invasive candidiasis, a potentially fatal infection that can strike people with compromised immune systems, including those with HIV, cancer patients undergoing chemotherapy, and

patients taking immunosuppressive medications.<sup>[4]</sup> Fungal pathogens such as *Candida*, *Aspergillus*, *Fusarium*, *Mucorales*, and molds can cause healthcare-associated infections (HAI), as well as opportunistic and systemic infections in patients with underlying medical problems. Fungal pathogens are the source of endemic mycoses that are common and can be fatal in certain regions. These include *Blastomycosis*, *Coccidioidomycosis*, *Histoplasmosis*, *Talaromycosis*, *Paracoccidioidomycosis*, and *Sporotrichosis*.<sup>[5]</sup>

## MATERIAL AND METHOD

### Collection of plant material

The leaves of *Cynodon dactylon* and *Aegle marmelos* were collected from the nearby regions of Sawantwadi, Sindhudurg. The leaves were washed and dried in the shed and powder was prepared for the extraction.

### PROCESSING OF PLANT MATERIAL

The extraction of *Cynodon dactylon* and *Aegle marmelos* was done by maceration method and ethanol and n-hexane was used as solvents respectively.

### Ingredients

The ingredients commonly used for preparation of antifungal soap has been mentioned in the Table No. 1

**Table No 1: Ingredients used in soap formulation and their description.**

Ingredients	Description
Base oils	Herbal soaps are usually made from a mixture of different base oils, such as olive oil and coconut oil, palm oil or castor oil. These oils have hydrating characteristics and contribute to a rich lather.
Essential oils	Essential oils are derived from various plants and are used in herbal soaps to impart fragrance and therapeutic effects. For example, lavender oil for relaxation, tea tree oil for its antibacterial properties, or eucalyptus oil for its calming effect.
Herbs or plants	Dried herbs or plant substances are often added to herbal soaps for their healing or exfoliating properties. For example, chamomile flowers to calm, calendula petals for their anti-inflammatory properties, or oatmeal for gentle exfoliation.
Natural dyes	Some herbal soaps can use natural dyes from plants or minerals, such as turmeric powder for a yellow colour spirulina powder for green, or activated carbon for black.

**Formulation of Polyherbal soap:** 1.5 grams of *Cynodon dactylon* and 1 gram of *Aegle marmelos* extract were added to a beaker. Then to this beaker, 1 gram of vitamin C, 1 gram of

vitamin E, and SLS were added in varying quantities (0g, 0.5g, 1g, and 1.5g), 1 gram of turmeric, 1 ml of rosewater, and stir for 2 to 3 min. Given a span on induction and added some water.

Glycerin basic soap was melted and the above mixture was incorporated into the melted solution with continuous agitation for 30 minutes until the molten mixture became homogeneous then added few drops of lavender essential oil to the preparation. The semisolid mixture was poured into a mold and allowed to solidify.<sup>[7]</sup>

**Table no 2: Contents of Formulation.**

Ingredients	F1	F2	F3	F4
<i>Cynodon dactylon</i> extract	1.5g	1.5g	1.5g	1.5g
<i>Aegle marmelos</i> extract	1g	1g	1g	1g
Glycerin Soap base	65g	65g	65g	65g
Vitamin C (Ascorbic acid)	1g	1g	1g	1g
SLS	-	0.5g	1g	1.5g
Vitamin E	1g	1g	1g	1g
Turmeric	1g	1g	1g	1g
Lavender essential oil	2ml	2ml	2ml	2ml
Rose water	1ml	1ml	1ml	1ml
Distilled water	q. s.	q. s.	q. s.	q. s.

### Evaluation of soap

The quality of the developed formulation was evaluated using the following physico-chemical criteria in comparison to herbal soap that is currently on the market.

### Physical parameters

The prepared soap was placed on a white background so that the color could be seen with the naked eye. The odour of the soap was smelled by applying preparation on hand.

### pH

The pH of the manufactured soap was determined by touching a pH strip to the freshly made soap and then dissolving 1 gram in 10 ml water with a digital pH meter.

### Irritation

It is done by applying soap to the skin for ten minutes. If no irritation then it is considered a non-irritant product.<sup>[8]</sup>



### Foam Height

A 0.5 gm soap sample was dispersed in 25 milliliters of distilled water. The mixture was then transferred to a 100 ml measuring cylinder and diluted up to 50 ml of water. 25 strokes were used, and the aqueous volume was measured up to 50 mL. The foam's height above the aqueous volume was also measured.<sup>[9]</sup>

### Foam Retention

25 ml of the 1% soap solution was put into a 100 ml graduated measuring cylinder. The cylinder was covered with a palm and shaken ten times. The volume of foam was measured at 1-minute intervals for four minutes.<sup>[10]</sup>

### Saponification value

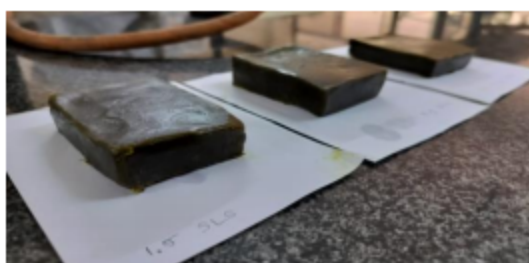
About 2 g of soap sample was placed in a conical flask, and its weight was estimated in w g. The soap sample was dissolved in 25 ml of 0.5 N alcoholic potassium-hydroxide solutions. The reaction mixture was then refluxed for 30 minutes in a water bath with a water condenser. The resulting solution was cooled and titrated against a 0.5 N HCl solution adding 1 ml of phenolphthalein as an indicator. The amount of acid necessary was recorded (a). An identical blank experiment (leaving the soap sample) was performed. Number of ml of hydrochloric acid required was noted (b).<sup>[11]</sup>

**Saponification value = Volume of acid required to neutralize remaining KOH × Equivalent factor\*1000/w = (b-a)\*0.02805\*1000/w**

## RESULTS

### Physical Appearance

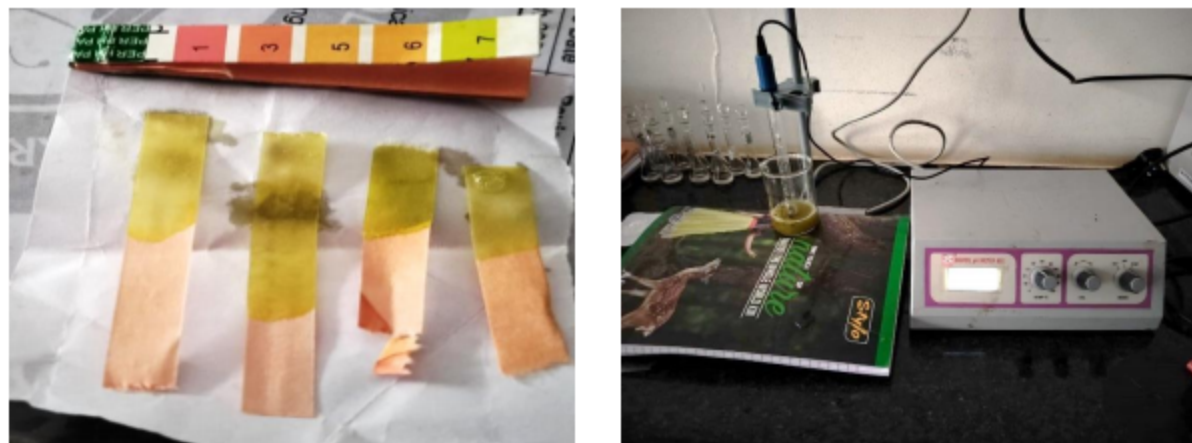
The physical properties of the herbal soap are noteworthy for their distinct characteristics. The soap exhibits a rich and captivating Greenish Brown, immediately drawing attention to its natural and organic composition. This coloration is a direct result of the herbal ingredients used in its formulation, showcasing the vibrant hues derived from nature.



**Figure No 1: Appearance of soaps.**

## pH

The results of the pH testing revealed that your herbal soap exhibits a basic pH level, with a value above 7 on the pH scale. This alkaline nature of the soap can have several implications for its potential uses and skin benefits, making it suitable for specific skincare applications.



**Figure No 2: pH determination by different methods.**

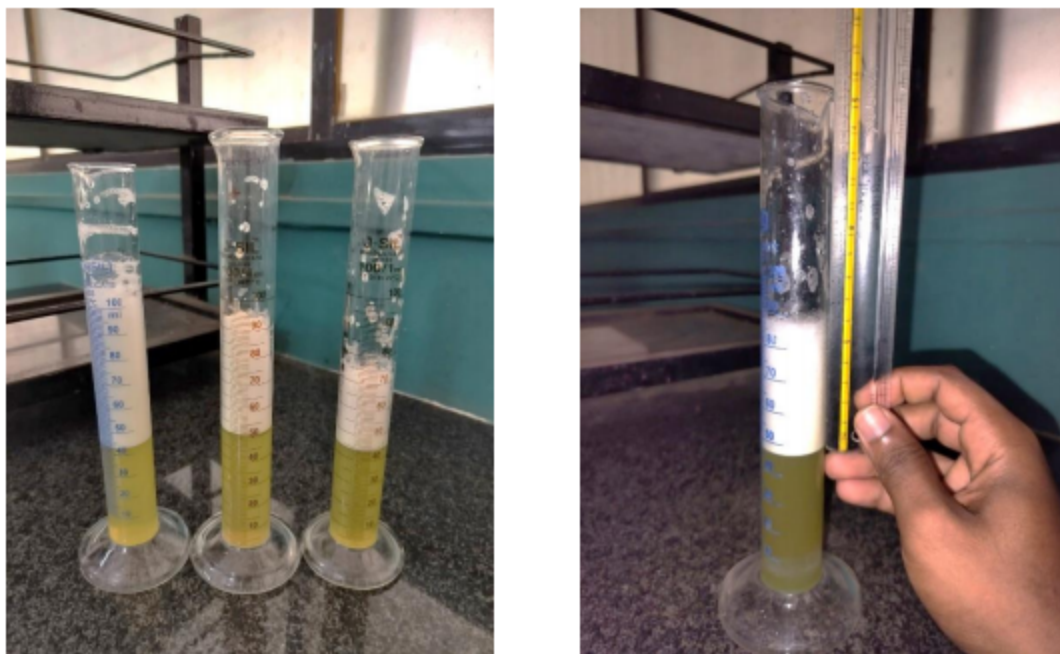
## Skin Irritancy

The results unequivocally indicate that your formulated soap is non-irritative to the skin. This non-irritative quality is a significant advantage, as it means that our herbal soap can be applied directly to the skin without causing discomfort or adverse reactions. This characteristic opens up the possibility of utilizing the soap for its antifungal action, making it a versatile choice for maintaining skin hygiene and potentially combating harmful microbes. The absence of skin irritancy not only enhances the user experience but also broadens the range of applications for our herbal soap, positioning it as a gentle yet effective solution for skincare needs.

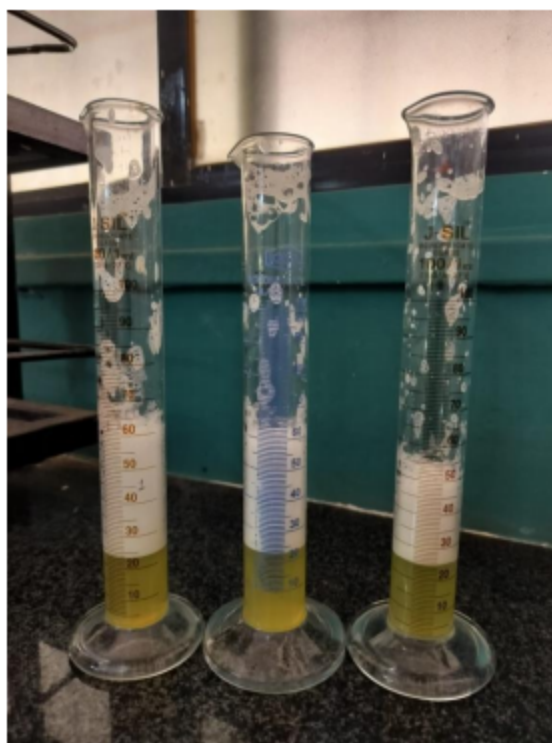
## Foaming capacity

Foaming capacity observation suggests a direct correlation between the amount of surfactant present in the soap formulation and its ability to produce foam. Surfactants are known for their foaming properties, as they lower the surface tension of liquids, allowing them to trap air and form stable bubbles. This increase in foaming capacity as surfactant concentration rises can have practical implications. It means that by carefully adjusting the surfactant levels in soap formulation, we can control and enhance its lathering characteristics. This knowledge can be valuable when fine-tuning our soap formula to meet specific user preferences or application requirements. The foaming stability results of this test provide crucial information

regarding the foaming stability of your herbal soap. Soap with a longer foam retention time is advantageous; as it suggests that the soap can create and maintain a rich lather for an extended period. This characteristic can enhance user satisfaction and the effectiveness of the soap for various applications.



**Figure No 3: Foam height of F4, F3, and F2 respectively.**



**Figure No 4: Foam retention.**

### Saponification value

The saponification value is defined as "the number of milligrams of KOH required to neutralize the fatty acids obtained from complete hydrolysis of one gram of an oil sample."

The saponification number is determined by the molecular weight and percentage concentration of the fatty acid components. The comparison of various physicochemical parameters of the formulated soaps has been given in Table No. 3.

**Table No 3: Physicochemical Parameters of the Formulated Soap and Standard Soap.**

Sr. no.	Parameters	F1	F2	F3	F4	Standard
1	Colour & shape	Greenish Brown	Greenish Brown	Greenish Brown	Greenish Brown	White
2	Odour	Floral scent without being too pungent or overwhelming	Floral scent without being too pungent or overwhelming	Floral scent without being too pungent or overwhelming	Floral scent without being too pungent or overwhelming	Floral scent without being too pungent or overwhelming
3	pH	7.2	7.5	7.2	7.1	7.6
4	Foam Height	5cm	6cm	7.5cm	10cm	11cm
5	Foam Retention	3min	3.4min	3.7min	3.8min	4.2min
6	Irritation	Non-irritant	Non-irritant	Non-irritant	Non-irritant	Non-irritant
7	Saponification value	58.9	65.9	54	56.1	68.7

### DISCUSSION

Medicinal plants are considered as a rich source of various active constituents, which can be used in drug development and synthesis. Moreover, some plants are considered an important source of nutrition, and as a result of that these plants were recommended for their therapeutic values and activities.

As per a previous study by Gaherwal *et al.* n-Hexane extract of *Aegel marmelos* shows antifungal activity and according to Syahriel *et al* ethanolic extract of *Cynodon dactylon* also shows antifungal activity against various species of fungus<sup>[12,13]</sup> Hence, we chose these two plants for our study of the formulation and evaluation of antifungal soap.

The evaluation of anti-fungal herbal soap was performed successfully and tabulated in Table no. 3. The prepared herbal soap was shown in Diagram no. 1. The physicochemical parameters for herbal soap formulations F1, F2, F3 and F4 such as colour, appearance, and



pH were determined. The formulations have a Greenish Brown colour with a floral scent without being too pungent or overwhelming odour and have a good appearance. The pH was found to be within the range of 7.0 to 7.6. Healthy skin has a pH of 5.4 to 5.9, and the produced formulation's pH was confirmed to be neutral, causing no irritation or sensitization to the skin.<sup>[14]</sup>

Herbal soaps have a significant impact on the skin, leaving it soft, smooth, and supple. Chemical soaps, on the other hand, are loaded with toxins that can harm both the skin and one's health. Herbal soaps are an excellent alternative for better skin care and overall wellbeing. From the scent to the therapeutic value and the aromatic benefits to medicinal properties, herbal soap heals, soothes, and rejuvenates the skin.<sup>[15]</sup>

The formulated soap was a dry, stable solid with no colour change and an excellent look, and it foamed naturally without any extra surfactants. Varying time was observed for complete foam collapse of the different concentrations of SLS in aqueous solution. This fluctuation is indicative of the various constituent concentrations utilized in the manufacture of the soap base. While formulation D gives the most stable foam retention in distilled water over 3.8 min. while formulations A, B and C give the least foam retention in distilled water compared to formulation D.<sup>[16]</sup>

As a result, the combination we created is effective at treating a variety of fungus-related skin illnesses.

## CONCLUSION

In conclusion, the extracts of plants were found to be stable in soap. The formulated soap has good physicochemical properties, equivalent to the standard. When examined for various tests, the newly developed formulation produced positive results. The developed herbal soap formulation exhibits favorable physical properties. Based on evaluation studies, the formulation has good foaming properties and is non-irritating to the skin. Furthermore, the soap was standardized by evaluating a variety of physical and chemical parameters, such as pH appearance and odor, which yielded excellent results.

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