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# Formulation and Evaluation of Soap from Garlic an Antifungal Activity

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**ABSTRACT**

Fungi are eukaryotic organisms that can be either unicellular or multicellular, found in various environments across the globe.They appear in numerous forms, from those visible to the naked eye, like mushrooms, to microscopic varieties such as yeasts and molds.Although the majority of fungi do not significantly impact human health, there are several hundred species that do contribute to fungal infections or diseases. Fungal infections, known as mycoses, can range from common benign conditions like 'jock itch' to severe, life-threatening illnesses such as cryptococcal meningitis.The term 'antifungals' refers to all chemical compounds, pharmacological agents, and natural products utilized in the treatment of mycoses.

Since ancient times, herbs have been used for medicinal purposes. They play a role in both the prevention and treatment of ailments affecting the body, both internally and externally.

The skin serves as the body's outermost layer, protecting internal organs from external elements. Skin infections can manifest in various forms, such as bacterial infections, fungal infections, and other skin-related conditions. A range of products, including soaps, lotions, creams, and ointments, are available to cleanse the skin and protect it from different ailments. Among these, soap is the most commonly used product for daily skin cleansing and protection. Soaps cleanse the skin by eliminating dirt, excess oil, and impurities while also providing a refreshing and gentle effect. The objective of this study is to formulate a natural antifungal and antibacterial soap using Allium sativum as a substitute for synthetic chemical soaps, aiming to safeguard the skin against various infections. Allicin derived from Allium sativum possesses antifungal properties, while exhibits antibacterial and insecticidal properties. In the preparation of herbal soap, ingredients such as allicin are utilized due to their antifungal, antibacterial, and antiseptic qualities. All herbal aqueous extracts are combined with a soap base and characterized physicochemically for attributes such as color, odor, texture, foam test, moisture content, and pH.

**Keywords:** Polyherbal natural soap, Antifungal, Antibacterial, Allium Sativum

## Introduction:

Herbal soap is a variety of soap crafted from natural components sourced from different herbs and plants. Commonly utilized herbs in the production of herbal soap include lavender, mint, rosemary, and chamomile. These herbs are abundant in essential oils, vitamins, and minerals that offer numerous therapeutic advantages for the skin. Herbal soap is recognized for its calming, revitalizing, and healing attributes, making it a favored option for individuals with sensitive or dry skin. At present, a considerable number of cosmetic products are contaminated, and many other beauty items available in the market are of substandard quality, which may lead to potential side effects such as rashes, allergic reactions, and even the onset of skin diseases. Herbal soaps are composed of plant components such as seeds, rhizomes, and roots. They exhibit antibacterial, anti-aging, antioxidant, and antiseptic properties. Herbal soap does not contain any synthetic dyes, flavors, fluorides, or other additives commonly found in commercial soaps. Most individuals are unaware of the long-term consequences of using commercial soaps. According to Aiello, commercial products contain certain substances that are considered unhealthy and may pose risks to the body over time.

The herbs and essential oils incorporated in herbal products are not meant to penetrate beyond the outer layer of the skin. The addition of extracts in topical formulations can help reduce oxidative stress in the skin, which has been linked to slowing down the aging process.

The word 'cosmetic' is derived from the Greek term 'kosm tikos', which denotes the capability to arrange or the skill involved in decoration. The history of cosmetics is an ongoing story that dates back to prehistoric times, approximately 3000 BC, when early humans employed colors for decoration to lure prey and to shield themselves from adversaries by coloring their skin to evoke fear. According to the Drugs and Cosmetics Act, cosmetics are defined as products meant for application on the human body for purposes such as cleansing, beautifying, enhancing attractiveness, or altering appearance. It is crucial to understand that cosmetics do not necessitate a drug license. Herbal cosmetics, which incorporate phytochemicals from various botanical sources, are formulated to affect skin functions and provide vital nutrients for maintaining healthy skin or hair. The incorporation of natural herbs and their aromatic properties in cosmetic formulations is categorized as herbal cosmetics.

The Drug and Cosmetics Act specifies that herbs and essential oils in cosmetics must not assert the ability to penetrate beyond the skin's surface or claim therapeutic effects. Moreover, herbal soap formulations are classified as medicines or drugs, containing antibacterial and antifungal agents sourced from plant parts such as leaves, stems, roots, and fruits, aimed at treating injuries or ailments and promoting overall health. These formulations demonstrate antimicrobial properties and can be applied topically in various forms, including creams, lotions, gels, soaps, solvent extracts, or ointments, and are used to address a range of skin disorders. Skin infections are frequently caused by fungi, Staphylococcus aureus, and Streptococcus species. Ethnomedical practices utilize juices and extracts from plant leaves for their advantageous properties. Antifungal soap is a specialized soap created to help individuals eliminate various fungal infections. This soap is particularly effective against conditions such as athlete's foot and jock itch. Additionally, it may assist in the treatment of other

India boasts a rich legacy of traditional medicine, encompassing various components such as Ayurveda, Siddha, and Unani. For centuries, traditional health care has thrived in this nation. The Indian systems of medicine, including Ayurveda, can be examined through modern scientific methods to yield improved outcomes in health care. Antifungal soap is a category of soap designed to assist individuals in eliminating various fungal infections. This soap is generally effective against conditions like athlete’s foot and jock itch. Additionally, it may prove beneficial in treating other non-fungal skin ailments, including psoriasis and eczema. Athlete’s foot is a condition that can potentially be eradicated with the regular use of antifungal soap. This type of infection is commonly contracted by individuals who frequently utilize public showers. Locations such as truck stops, public swimming facilities, and fitness centers equipped with showers are among the most probable environments for acquiring athlete’s foot.


Aim**:** Formulation & Evaluation Of Soap From Garlic An Antifungal Activity

Objectives:-

- Combat fungal infections naturally.
- Provide gentle cleansing.
- Moisturize the skin.
- Promote overall skin health.
- Prevent future infections.
- Ensure efficacy.
- Satisfy users with a pleasant experience.
- Maintain eco-friendliness.

| | F1 | F2 | F3 | F4 | F5 | F6 | F7 |
|---|---|---|---|---|---|---|---|
| **Garlic Extract** | **5ml** | **5ml** | **5ml** | **5ml** | **5ml** | **5ml** | **5ml** |
| **Base** | **30gm** | **30 gm** | **30 gm** | **30gm** | **30gm** | **30gm** | **30gm** |
| **SLS** | **4 gm** | **4 gm** | **5 gm** | **3 gm** | **3 gm** | **5 gm** | **4 gm** |
| **EDTA** | **2 gm** | **2 gm** | **1 gm** | **3 gm** | **1 gm** | **1 gm** | **2 gm** |
| **Mineral Oil** | **4 ml** | **5 ml** | **4ml** | **4ml** | **4ml** | **3ml** | **3ml** |
| **Citric acid** | **1 gm** | **1 gm** | **1 gm** | **1gm** | **1gm** | **1gm** | **1gm** |
| **Water** | **q.s** | **q.s** | **q.s** | **q.s** | **q.s** | **q.s** | **q.s** |

- Offer affordability.

## Materials and Methods:

Materials

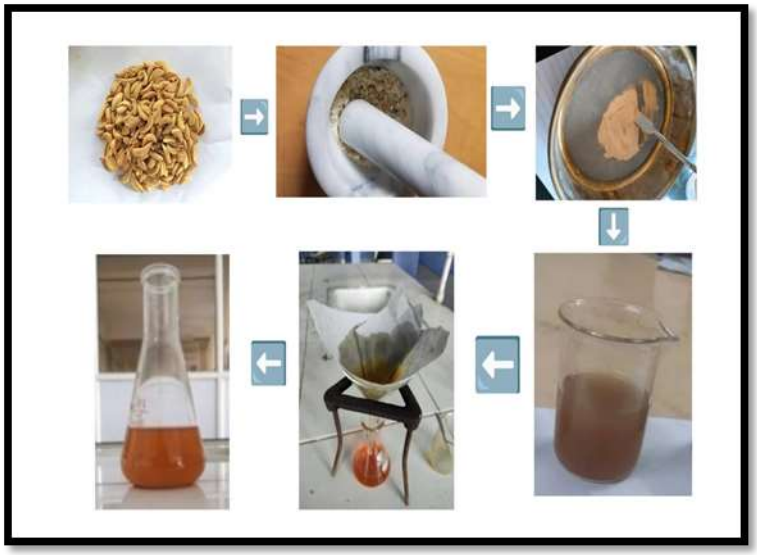
Formulation table 01

Fresh Garlic were collected from the Farm Kada. The leaves were washed with distilled water and shade-dried for 10–15 days. The dried petals were then ground to a fine powder and passed through a sieve for uniform size distribution.

Bulbs of Allium sativum,cut freeze-dreied or dreied at a tempreture not exceeding 65 C powdered.

The plant was authenticated before use.

Method :Extraction Via Maceration



**Step 1: Collection of Garlic petal**

Fresh green Garlic petals are harvested from the soil.

**Step 2: Shade Drying**

The collected petals are kept in a shaded, ventilated area to dry naturally and retain phytochemicals.

**Step 3: Grinding**

The dried petals are coarsely powdered using a mortar and pestle.

**Step 4: Sieving**

The powdered material is sieved to achieve a consistent particle size suitable for extraction.

**Step 5: Weighing of Powder**

The sieved powder is accurately weighed using a digital weighing balance for use in the extraction process.

**Step 6: Maceration with Solvent**The weighed powder is transferred into a conical flask, and a suitable solvent (like ethanol or a hydroalcoholic mixture) is added. The mixture is left undisturbed or occasionally shaken for several days.

**Step 7: Filtration**

After the maceration period, the extract is filtered using a funnel and filter paper into a beaker to separate the liquid extract from the plant residue.

## Preparation method of soap:

Types of Soap Preparation

A. Melt and Pour Soap

In essence, any soap that is crafted by hand is termed "glycerin soap." The glycerin that is typically found in commercial soaps is eliminated. Consequently, all handmade soaps are rich in glycerin. Generally, additional glycerin is incorporated into clear soap to produce a bar that is exceptionally moisturizing and nourishing. Glycerin acts as a "humectant," providing hydration to the skin; the concept is that when you cleanse. Using glycerin soap, a thin layer of glycerin remains on the skin, drawing in moisture. Large blocks of clear soap foundation can be purchased; these can be melted, colored, and scented before being poured into molds. The melt and pour soap-making method is gaining popularity due to its ease of use. This technique encompasses all the aspects of creating cold-process soap, while also introducing a few additional steps.

B. Cold Process Soap

Fatty acids, which are present in nearly all oils, are mixed with sodium hydroxide (lye) to produce cold process soap. A small quantity of sodium hydroxide and water is utilized in the cold process soap-making procedure, initiating a chemical reaction. This method is complex and yields high-quality results.

C. Hot Process Soaps

The cold process method has several variations. In the hot process soap-making technique, all ingredients are combined in a pot and heated on a stove. As the soap undergoes various stages of processing, excess water is evaporated.

D. Rebatching Soaps Rebatching is an alternative technique for producing cold process soap, often referred to as French milled or triple milled soap. To create cold process soap from scratch, the ingredients are ground and mixed with a small amount of liquid in a kettle. Once the mixture has melted into a viscous consistency, fragrance and colorants can be added. This method is commonly employed to preserve the aroma or therapeutic properties of different essential oils.

Procedure

The oil phase ingredients were weighed and mixed with continuous stirring at the temperature of 120$^{o}$c to form a uniform liquid. The water phase ingredients were weighed and mixed with continuous stirring at the temperature of 80oC to form a uniform liquid. The oil phase was incorporated in the water phase at 80oC with continuous stirring until the semisolid consistency was obtained and added as a preservative. Continuous stirring to soap bases till the uniform dispersion of the ingredients was achieved. The soap base fills the suitable soap mold stored the room temperature and it's evaluated.

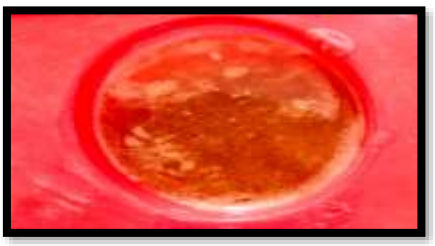


**Fig :1 Soap**

## Evaluation Test:-

**Physical Parameter**:- The prepared herbal soaps underwent a visual inspection to assess their color, weight variation, odor, and overall appearance.

The pH level of each soap was determined using a pH meter.

**Weight Variation:-** A total of 10 soaps were collected to measure their individual weights, from which the average weight of the herbal soaps was calculated.

**Percentage:-** The empty container used for storing the herbal soap formulation was weighed, followed by weighing the container with the herbal soap formulation. This process provided the practical yield. The percentage yield was then calculated using the following formula.

**Percentage Yield =** Practical Yield / Theoretical Yield × 100

Solubility:- Two grams of soap were added to 10 ml of solvents and shaken for 2 minutes to observe the solubility results.

**Determination of Percentage:-** Five grams of the prepared herbal soap were dissolved in 50 ml of neutralized alcohol within a conical flask. The mixture was then boiled under reflux in a water bath for 30 minutes. After cooling, 1 ml of phenolphthalein solution was added as an indicator, and the solution was titrated with 0.1 HCL.

**Foam Height:-** 0.5 grams of the prepared soap were dissolved in distilled water, and the volume was adjusted to 50 ml in a 100 ml measuring cylinder. The foam height was measured above the aqueous volume after giving 25 strokes.

**Foam Retention**:- A 25 ml solution of 1% soap was prepared and transferred into a 100 ml measuring cylinder. The cylinder was shaken 10 times, and the volume of foam was recorded at one-minute intervals for 4 to 5 minutes.

**Skin Irritancy Test:-** An area of 1 sq.cm was marked on the dorsal surface of the left hand. The herbal soap was applied to this designated area, and the time was noted. Irritancy, erythema, and edema were monitored at regular intervals for up to 24 hours and documented.

## Result & Discussion

**Table 02**

| Formulation code | Color | odor | Avg. weight | Percentage Yield |
|---|---|---|---|---|
| F1 | Brown | Fragrant | 46.07 gm | 92.14% |
| F2 | Dark brown | Fragrant | 47.11gm | 94.2% |
| F3 | Dark brown | Fragrant | 46.02gm | 92.04% |
| F4 | Dark Brown | Fragrant | 46.83 gm | 93.72% |
| F5 | Light brown | Fragrant | 44.96gm | 89.9% |
| F6 | Brown | Fragrant | 45.96gm | 91.92% |
| F7 | light brown | Fragrant | 45.05gm | 90.05% |

**Table03 :-Physical Parameters**

| Formulation Code | pH | Free alkali | Foam height | Foam Retention |
|---|---|---|---|---|
| F1 | 7.9 | 0.35 | 26cm | 03min |
| F2 | 7.4 | 0.51 | 30cm | 05min |
| F3 | 8.0 | 0.47 | 24cm | 04min |
| F4 | 7.5 | 0.31 | 22cm | 03min |
| F5 | 6.8 | 0.40 | 29cm | 03min |
| F6 | 7.7 | 0.43 | 28cm | 04min |
| F7 | 7.2 | 0.39 | 25cm | 04min |

**Table 04:- Skin Irritancy Test**

| Formulation code | 2 Hr | 4 Hr | 8 Hr | 16 Hr |
|---|---|---|---|---|
| F1 | NIL | NIL | NIL | NIL |
| F2 | NIL | NIL | NIL | NIL |
| F3 | NIL | NIL | NIL | NIL |
| F4 | NIL | NIL | NIL | NIL |
| F5 | NIL | NIL | NIL | NIL |
| F6 | NIL | NIL | NIL | NIL |
| F7 | NIL | NIL | NIL | NIL |

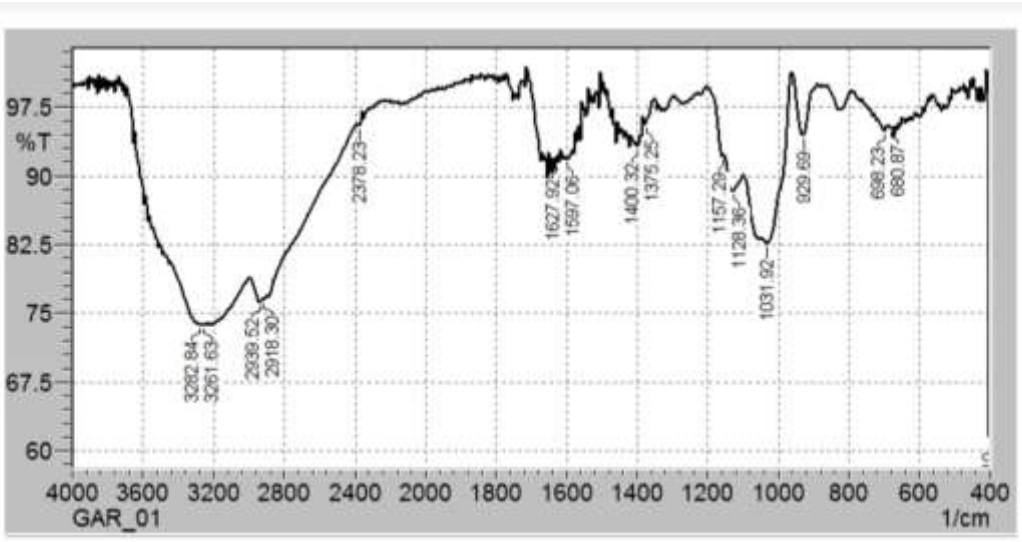



**FIG : IR OF GARLIC**

**Table 05: FTIR Peak Assignment Table**

| **Wavenumber ($cm^{-1}$)** | **Functional Group / Bond** | **Type of Vibration** |
|---|---|---|
| 3282.84 / 3216.63 | O–H (phenols or alcohols) / N–H (amines) | Stretching (broad due to H-bonding) |
| 2936.52 / 2918.30 | C–H (alkanes) | Stretching (–$CH_2$– and –$CH_3$) |
| 2378.23 | $CO_2$ (possible atmospheric contamination) | Asymmetric stretching |
| 1627.92 / 1597.09 | C=C (aromatic ring) / N–H (secondary amide) | C=C stretching / N–H bending |
| 1400.32 / 1375.25 | $CH_3$ / $CH_2$ (alkanes) | Bending (scissoring/wagging) |
| 1157.29 / 1128.96 | C–O (ethers, alcohols, esters) | Stretching |
| 1031.92 | C–O / C–N | Stretching (alcohol/amine) |
| 929.60 | =C–H (alkenes) | Out-of-plane bending |
| 698.23 / 669.87 | C–H (aromatic) | Out-of-plane bending (mono-substituted) |

## Conclusion:-

This research ultimately determined that antifungal soaps derived from herbal sources are developed, leading us to conclude that garlic to create a soap with antifungal properties suitable for various skin conditions and daily use for maintaining healthy skin. Herbal antifungal soaps demonstrate superior efficacy and reduced side effects when compared to synthetic soaps. The extensive use of synthetic antifungal soaps may result in resistance or adverse effects on the body; however, herbal soaps do not exhibit such resistance or side effects. They are safe for use. Herbal soaps significantly enhance the skin, rendering it soft, smooth, and supple. In contrast, chemical soaps contain harmful substances that can damage both the skin and overall health. This study focuses on the formulation of herbal soap utilizing different oil bases. Relevant literature concerning the preparation of herbal soap, selection of excipients, manufacturing methods, etc., has been gathered and reviewed. Based on the optimization of parameters, it was concluded that herbal soap can be produced using a soap base. Consequently, all formulations from F1 to F7 met the criteria for herbal soap, including shape, color, odor, total fatty matter, and skin irritation tests. The antifungal activity assessed using agar medium revealed that formulations F1, F2, F4, and F7 exhibited good antifungal activity compared to other formulations. The numerous advantages of herbal soaps render them an excellent choice for enhanced skin care and optimal health outcomes. Natural soaps present fewer side effects, such as rashes and irritations, compared to synthetic soaps. The herbal soaps created from these herbs met the evaluation criteria.

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