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Formulation and Quality Evaluation of Herbal Soap Cosmeceutical using Essential Oils & Natural Ingredients by Saponification Reaction

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Herbal soap was formulated using the leaf and bark extract of Azadirachta indica (Neem), Ocimum tenuiflorum (Tulsi), Sapindus mukorussi (Indian soapberry/Reetha) and Acacia concinna (Shikakai) powder. Ayurvedic cosmetics are also known as herbal cosmetics. The natural content in the herbs does not have any side effect on the human body (Joshi & Pawar, 2015). Most herbal supplements are based on several botanical ingredients with long histories of traditional or folk medicine usage. Among the numerous botanical ingredients available in the market today (Saikia et al., 2006). Numerous chemical toxins and microorganisms present in the atmosphere may cause chemical infection and damage to skin. Cosmetics alone are not sufficient to take care of skin and body parts. Neem (Azadirachta indica) tree has attracted worldwide prominence owing to its wide range of medicinal properties. Neem leaves and its constituents have been demonstrated to exhibit anti-inflammatory, antihyperglycemic, antiulcer (Subapriya & Nagini, 2005), antimalarial, antifungal, antibacterial, antimutagenic and anticarcinogenic properties. Herbal soap ingredients were used reetha, neem, shikekai and tulsi., in which neem leaf and seed were found effective against some dermatophytes. Shikakai and Reetha act as a detergent and have cleaning and foaming activity and Tulsi shows antiviral activity (Amrutkar, 2022). This study focuses on the development and assessment of a herbal soap that includes glycerin, coconut oil and ajwain oil (Trachyspermum ammi), which is recognized for its antibacterial and antifungal qualities. The soap was made using the conventional saponification method, and its moisture content, foam retention, and physical attractiveness were evaluated. The finished soap had a good look, a pleasing smell, and a yellowish-brown tint and also had different colours because of using food grade colours. It retained a 12 cm foam height and 31% moisture content. These results imply that herbal soap containing ajwain oil and other organic components can successfully improve skin health and offer antibacterial defense. The growing consumer preference for natural and environmentally friendly personal care products is in line with this, underscoring the potential applications of herbal formulations in the cosmetics and pharmaceutical industries.

Keywords: herbal soap, cosmeceutical, anti-inflammatory, herbs, drugs, skin friendly

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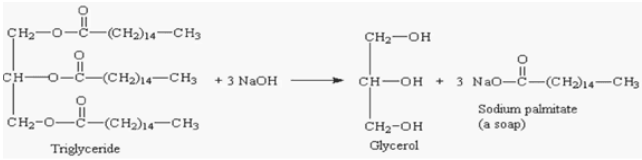
1. Introduction

Health hygiene is critical due to the growing number of diseases caused by bacteria. [Doron S, Gorbach SL.2008] People have been using medicinal plants for healing purposes since the beginning of time. A wide range of illnesses and ailments have been naturally treated with the leaves, stems, and roots of several medicinal plants. Ayurvedic remedies are notable for their efficacy and safety, despite the fact that many plant-based medicines have been supplanted by synthetic counterparts. (Kumar, 2017) These days, herbal compounds are the source of pharmaceuticals because synthetic drugs have many undesirable side effects. The interest in herbal medicines was growing among researchers as a result. The use of herbal remedies to cure a variety of illnesses gained traction due to its significance in folklore. In the current environment, plant-based formulations that take into account the active ingredients of the many herbal medications being manufactured are crucial to the growth of the pharmaceutical business. Medicinal oil, also known as vital oil, has been mentioned by numerous experts as one of the most often utilized ingredients in herbal compositions. Among the members of the Apiaceae family, tamam (ajwain) is the most widely known traditional plant. Ajwain is a traditional energetic plant used to treat a variety of human ailments. Ajwain, also known as ammi oil, is used to treat neurological conditions such as paralysis, tremor, and persistent pain (Ankita, 2024) There is a huge market for several types of bath soaps, including herbal soaps. Maintaining personal hygiene and being clean is a major business. However, soap users also experience a variety of skin-related problems. A dermatologist will recommend patients with skin conditions such dryness, itching, acne, or contact dermatitis and will counsel them to use certain skin care products, such as soap, based on their skin type and other associated conditions (Purnamawati, 2017).

Crude preparation of soapy plants is able to soften the skin's epidermis, enhance greater penetration and clean acne and also promote healing and resolution in quickly in time. In this review article, the herbal soap contains neem, tulsi, shikakai and reetha as natural plant ingredients and this content gives or shows antibacterial antifungal & anti-inflammatory activity (Prachi Bhimte, 2023).

In this soap, neem is the main compound, and shows medicinal properties. Neem leaf and its extract exhibit immunomodulatory, anti-inflammatory, antiulcer, antimalarial, antifungal, antibacterial, antioxidant and anticarcinogenic properties. Tulsi has got the greatest medicinal value. Tulsi is effective for diabetes. They reduce the blood glucose level tulsi also used in severe acute respiratory syndrome. Juice of its leaves gives relief from cold fever, bronchitis and cough. Tulsi reduces stress, enhances stamina, relieves inflammation and also shows antifungal activity, so tulsi is also used as the main compound in this herbal soap. The main antifungal activity of Tulsi serves to be beneficial in soap formulation (Akash Romade, 2024). Reetha is an exceptional cleanser. Hence, it's a perfect substitute for soap a facewash due to the presence of saponin. It is also good for use on sensitive skin. The combination of reetha and chickpeas gives a gentle and enriching experience to the skin. It has conditioning properties. Therefore, it keeps skin moisturized and cool. Reetha prevents the skin from drying and keeps it soft and supple. It also helps to treat eczema and psoriasis. Shikakai is quite effective in treating various skin infections like scabies and is also used as an anti-wrinkle property [Mishra & Jha, 2020].



Fatty acids combined with alkali salts that come from plants or vegetables and include organic, or naturally scented substances are known as herbal soaps. Two processes, the hot process and the cold process, are used in the preparation process, which calls for the presence of bases like potassium and sodium hydroxide in addition to fatty acids to make soap. Fats and 0ils used in soap are produced by the saponification (hydrolysis) of a triglyceride (fat or oil). In this process, the triglyceride is reacted with a strong base such as sodium or called a soap. Potassium hydroxide to produce glycerol and fatty acid salts.

The chemical process known as saponification which happens when fats or oils are combined with an alkali, usually potassium hydroxide (KOH) or sodium hydroxide (NAOH), is what makes herbal soap.

An alkali, typically sodium hydroxide (NAOH) or potassium hydroxide (KOH), serves as a catalyst in the saponification process (Spiz, Lus, cd. Soup 1995). The alkali reacts with triglycerides in fats and oils, breaking them down into constituent molecules. An alkali, typically sodium hydroxide (NaOH) or potassium hydroxide (KOH), serves as a catalyst in the saponification process. The alkali reacts with triglycerides in fats and oils, breaking them down into constituent molecules.

2. Materials & Methods

Chemicals & Apparatus: Beaker, Heating Mantle, Hot Air Oven, Test Tubes, Measuring Cylinder, China Dish, Stirrer spoon, Petri Plate etc. were collected from the lab of the college itself.

1. Herbal Soap Preparation

Glycerin soap base was melted with the help of a microwave oven. For these, essential oils were added and herbal extracts of bark and leaves were added to the mixture and stirred continuously while boiling the solution. With steady stirring, sodium hydroxide was gradually added to the mixture. The solution was mixed with coconut oil and ethanol. Allowed to stand for ten minutes. To the sides of the vessel, the colours & fragrances were added. All the ingredients in the picture were mixed in the proper manner using a stirrer spoon and after adding the rose oil and fragrance ingredients to the mixture, pour the mixture into a mold and cool at room temperature. The mixture was sieved using manual Sievers, then poured into Silicon Soap moulds. The soaps were cooled at room temperature for about 3 to 4 hours.

Table 1: Herbal Soap Formulation

Sl. No.	Materials	Role
1	Neem, Tulsi Extract	Anti-bacterial & Anti-inflammatory
2	Sodium Chloride	To precipitate out soap from the solution
3	Coconut, Ajwain oil & Olive oil	Anti-fungal & Saponifying agent
4	NaOH & KOH	Lye (Alkali)
5	Food grade colours & Fragrances	Colouring agent & perfuming agent.
6	Reetha & Shikakai	Surfactant
7	5% Glycerin soap base	Soap base with Humectant/Moisturizer

2. Evaluation of Formulated Soap

i) Physical Evaluation

The formulated soap was evaluated for its color, odor and appearance found by smelling the product. Appearance & color was checked by naked eyes against a white background, and odor was smelled. Color, Odor and Appearance were examined by 10 individual panelists in the Dept. of Biotechnology.

ii) pH

The formulation was dissolved in 100 ml of distilled water & stored for 2 hours. The measurement of pH of the formulation was done with pH Paper (Wei H, 2008).

iii) Skin Irritation Test

Soap was applied on the skin of the hands of 4 volunteers and observed (Khosrowpour, 2019).

iv) Washing Capability

The herbal soap was put through a formulation test, as well as the simplicity with which it could be washed with water (Devi, 2021).

v) Foam Height

0.5 g sample of soap was taken, dispersed in 25 ml distilled water. Then transferred it into a 100 ml measuring cylinder. Volume was adjusted to 50 ml of water. Shake the above sample solution 25 times and measure the foam height (Mainc, Sandy 1995).

vi) Foam Retention Time

25 ml of the 1% soap solution was taken into a 100 ml graduated measuring cylinder. The cylinder was covered with a hand and shaken 10 times. The volume of foam at 10-minute intervals for 50 minutes was recorded (Khaloud Al Badi, Shah A. Khan, 2014). Foam retention time was shown at 12 cm.

vii) Moisture Content

The moisture content was used to estimate the percentage of water in the soap by drying the soap to a constant weight. The soap was weighed and recorded as the wet weight of the sample and was dried from 100 to 115°C using a dryer. The sample was cooled and weighed to find the dry weight to sample. The moisture content was determined using the formula (Kandasamy, 2014).

% Moisture content = Initial weight – Final weight / Final weight × 100

viii) Determination of Alcohol Insoluble Matter

5g of the sample was taken in a conical flask, added it to 50 ml of warm ethanol & shaken vigorously to dissolve. The solution was filtered through filter paper with 20 ml warm ethanol and dried it at 105°C for 1hr (Uhlig & Duemmling. 1936).

% Alcohol insoluble matter = wt. of residue / wt. of sample x 100

3. Results and Discussion

1. Herbal Soap Preparation

The current effort of producing herbal soaps with good foam-producing capabilities has been produced successfully. Different types of Natural Soap bars, liquid soaps and hand sanitizers made from natural ingredients were created. The formulations showed good results when evaluated for many characteristics, including size and shape, pH, colour. According to the study, herbal products can be successfully prepared utilizing the heat process to create medicated herbal soaps.

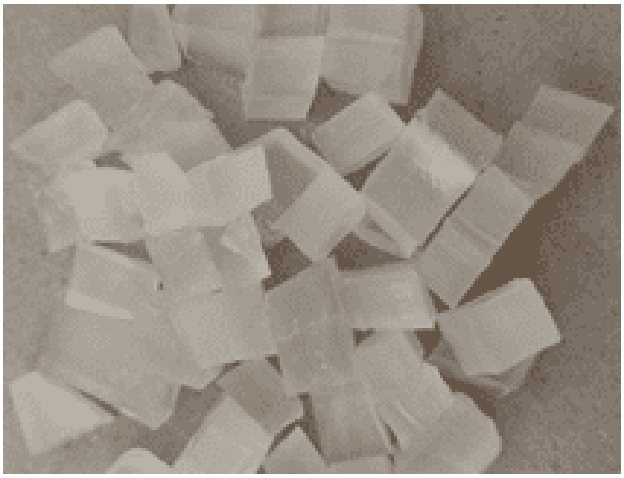


Figure 1: 5% Glycerin Soap base with Humectant properties

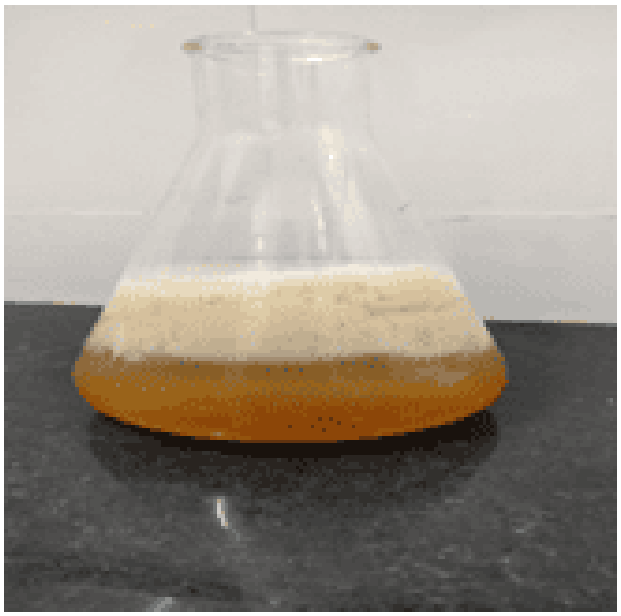


Figure 2: Precipitated Crude soap extract

Figure 3: Different types of Formulated Soap bars (Soft soaps & hard soaps).

Figure 4: Liquid soap/ Body wash with Potassium Lye.

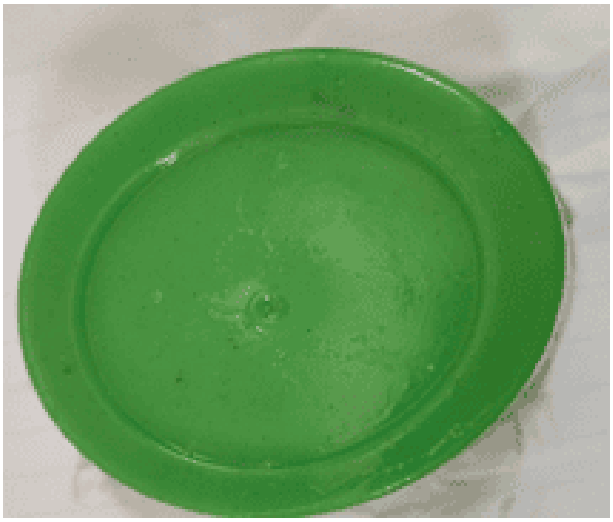


Figure 5: Soft alkali herbal skin soap blended with Neem as the main ingredient & Aloe extract.

2. Evaluation of Formulated Soap

1. Physical Examination

The physical parameters of natural soap were evaluated. It occurs as green, pale magenta, pink, light brownish tint & white. It has a pleasant odor & appearance was good appearance.

Figure 6: Skin patch test for allergy investigation of soap application.

Table 2: Physical parameters of Natural Soap

Sl. No.	Parameter	Herbal soap
1	Colour	Pale Brownish Tint, Green, Light Magenta & White.
2	Odour	Pleasant
3	Appearance	Good

2. Foam Retention Test

Foam height was found to be 12cm.

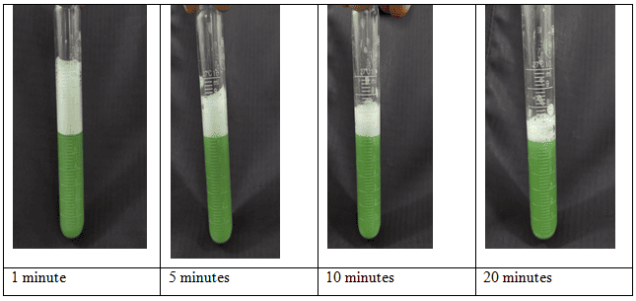


Figure 7: Froth – Retention test at regular time intervals (up to -20 mins).

Table 3: Foam Retention time

Sl. No.	Time (mins)	Foam retention (CMS)
1	1 min	13.5
2	5 min	12.0
3	10 min	11.5
4	20 min	10

3. Moisture Content

Figure 8: Petri dish containing dried soap sample

% Moisture content = Initial weight – Final weight/Final weight × 100

= 10-7.6/7.6 x 100

= 2.4/7.6 x 100

= 0.31 x 100

% Moisture content = 31%

4. Alcohol Insoluble Matter

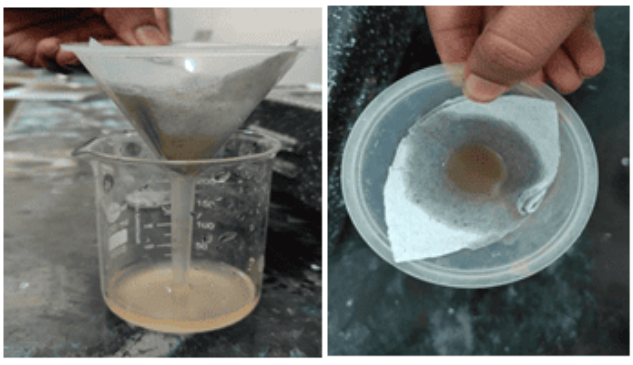


Figure 9: Soap crush powder showing solubilization index in Alcohol.

% Alcohol Insoluble Matter = wt. of residue / wt. of sample X 100

= 0.31gm/5gm X 100

= 0.062 X 100

% Alcohol Insoluble Matter = 6.2%

In this competitive scenario of the soap manufacturing business, the chemical composition of soap bars must be accurate. As a process, soap composition testing applies advanced laboratory techniques to ensure both product resilience and safety. It starts with the precise weight measurements of the ingredients used, such as the oils and alkalis mix, to start saponification. Indeed, it is a necessary chemical process that can only occur with the introduction of lye. In this regard, at an industrial level, a complete understanding of the exact composition of these ingredients becomes imperative in the interest of quality control and meeting safety standards.

4. Conclusion

Herbal cosmetics are prepared, using permissible cosmetic ingredients to form the base in which one or more herbal ingredients are used to treat different skin ailments and for beautification. The chemical formulation of all these cosmetic products includes the addition of various natural additives like waxes, oils, natural color, natural fragrances and parts of plants like leaves, etc. Cosmeceuticals are agents that lie somewhere between pure cosmetics (lipstick and rouge) and pure drug (antibiotics, corticosteroids) methods. Cosmetic products are the best option to reduce skin problems such as hyperpigmentation, skin wrinkling, skin aging and rough skin texture etc. The demand for herbal cosmetics is rapidly expanding. The advantages of herbal cosmetics are lower cost, side effects free, eco-friendly, safe to use etc. Also, it has a great future ahead as compared to synthetic cosmetics. Proper regulation of these herbs and standardization will lead to tremendous and significant growth in the herbal cosmetics field. Herbal soap preparation when compared to the contents of commercial soap, herbal soap is free of artificial colors, flavours, fluorides, and other ingredients. Because of their great medicinal value, affordability, availability, and compatibility, herbs are the natural products that are typically used in the treatment of practically all diseases and skin issues. In conclusion, the soaps prepared and physical properties of soap, which are made. Observed and recorded.

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