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Development and Assessment of an Herbal Bath Soap Enriched with Plant Extracts

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Abstract: ***The primary aim of this study is to develop an eco-friendly Ayurvedic bath soap using water-based extracts of plants with dermatological benefits as described in Ayurveda, specifically Orange peel, Aloevera and Almond oil. Orange peel were extracted in water, and this extract was combined with oils and lye in a saponification process to produce the soap. The resulting soap was assessed for physicochemical properties, including total fatty matter, moisture content, and pH, demonstrating favorable characteristics across these parameters. The formulated soap is suitable for all skin types. With further standardization, it may serve as an alternative to commercial medicinal soaps for skin whitening and acne treatment.***

Keywords: Ayurvedic Herbs, Medicinal Soap, Herbal Bath Soap.

I. INTRODUCTION

The skin, as the body's outermost layer, acts as a vital defense against various pathogens [1]. However, it is continually exposed to environmental factors, making it prone to damage [2]. Significant damage often results in the formation of scar tissue, which may appear discolored or depigmented [3]. For centuries, plants have been harnessed to treat various human ailments and infections due to their bioactive compounds, which can be used in products like ointments [4], creams, gels, lotions, soaps, or as crude and solvent extracts [5]. Plant extracts and their phytoconstituents show great potential in treating hyperpigmentation [6]. Traditional Ayurvedic plant- based remedies are gaining popularity in India [7], as growing evidence highlights their effectiveness relative to modern treatments [8]. Soap remains one of the most common skincare products for cleansing and maintaining skin health [9], though many chemical- based soaps can cause dryness and irritation [10]. In contrast, herbal soaps are becoming popular for their effectiveness in addressing skin concerns [11]. Ayurveda, for example, identifies certain "varnya" herbs that are known to inhibit tyrosinase, a function now recognized in modern skin care science [12].

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A. Citrus sinensis

Common name: Orange. The preliminary phytochemical analysis of orange reveals the presence of flavonoids, carotenoids, limonoids, and vitamin C. It is classified under the Rutaceae family [13].

B. Pharmacological Activities

Orange offers numerous skin benefits due to its diverse pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, and anti-aging properties [14]. Its flavonoids and vitamin C help protect the skin from oxidative stress, thus reducing fine lines and wrinkles [15]. Limonoids and flavonoids in orange provide soothing effects, calming irritation and reducing redness and inflammation [16]. Additionally, the compound limonene has antibacterial and antifungal properties, helping to prevent acne and skin infections [17]. The flavonoids in orange also inhibit melanin production, thereby reducing hyperpigmentation and brightening the skin [18]. Its vitamin C and flavonoids further hydrate and soften the skin, enhancing elasticity and firmness [19]. Carotenoids in orange offer photoprotection against UV radiation [20], while both flavonoids and limonoids promote faster wound healing. Altogether [21], these properties make orange a potent natural remedy for various skin concerns, such as acne, psoriasis, and dermatitis.

C. Aloevera

Aloe barbadensis miller is the scientific name for aloevera, a member of the Asphodelaceae family. Aloevera is widely recognized for its skin benefits, particularly its soothing, moisturizing, and protective effects. Its anti-inflammatory and antioxidant properties help to calm irritation, reduce redness, and alleviate conditions like acne, eczema, and psoriasis. Its hydrating properties lock in moisture, resulting in softer, smoother skin. Additionally, aloe vera's vitamin C and E content support collagen production, enhancing skin elasticity and diminishing fine lines and wrinkles.

D. Pharmacological Activities

Aloe vera promotes wound healing by accelerating tissue repair, boosting collagen synthesis, and reducing scar formation. Its antimicrobial properties effectively combat bacterial, viral, and fungal growth, making it beneficial for treating acne, wounds and various skin infections. Aloevera also has skin brightening effects, which help fade hyperpigmentation and dark spots, improving ovrall skin tone and radiance.

E. Almond Oil

Almond oil enhances skin elasticity and firmness, effectively reducing the appearance of stretch marks

and scars. Its gentle, non-comedogenic nature makes it ideal for sensitive skin, while its emollient properties improve skin texture and radiance. Consistent use of almond oil can help even out skin tone, reduce hyperpigmentation, and offer some protection against sun damage.

II. METHODS

A. Preparation of Soap Base

Twenty grams of almond oil were placed in a beaker. In a separate beaker, 14 grams of alkali were dissolved in 50 ml of distilled water with continuous stirring. The alkali solution was then added to the beaker containing the almond oil. This mixture was heated on a hot plate at low temperature with constant stirring until the oil smell dissipated, resulting in a homogeneous solution. The mixture was filtered using Whatman filter paper no. 41 and a Buchner funnel. The filtrate was allowed to settle.

B. Preparation of Orange Peel Soap

Dried orange peel was powdered and extracted with water. The soap base was heated using a double boiler method, and 10 ml of orange peel extract, along with a small amount of aloe vera gel, was added. This mixture was poured into soap molds and left to solidify at room temperature.

C. Physical Parameters

i. pH

The pH of the soap was measured by two methods: directly applying a pH strip to the freshly prepared soap and dissolving 1 gram of soap in 10 ml of water to measure the pH with a digital pH meter.

D. Determination of Percentage Free Alkali

Approximately 5 grams of the soap sample were added to 50 ml of neutralized alcohol and boiled for 30 minutes under reflux on a water bath, then allowed to cool [22]. Next, 1 ml of phenolphthalein solution was added, and the mixture was immediately titrated with 0.1 N HCl to determine free alkali content [22].

E. Foam Height

To measure foam height, 0.5 grams of soap was dispersed in 25 ml of distilled water. This solution was transferred to a 100 ml measuring cylinder, and the volume was made up to 50 ml with additional water. After giving the mixture 25 strokes, it was allowed to settle until the aqueous volume measured 50 ml, then the foam height above this aqueous volume was recorded [23].

F. Foam Retention

A 1% soap solution was prepared, and 25 ml of it was placed in a 100 ml measuring cylinder. The cylinder was covered and shaken for 10 minutes. The foam volume was then recorded at 1-minute intervals for 4 minutes [24].

G. Alcohol-Insoluble Matter

In a conical flask, 5 grams of the soap sample were mixed with 50 ml of warm ethanol and shaken vigorously until the soap completely dissolved. The solution was filtered through tared filter paper using an additional 20 ml of warm ethanol, then dried at 105°C for 1 hour. The weight of the dried paper was recorded to determine the alcohol- insoluble content [25].

H. Total Fatty Matter (TFM)

TFM was determined by acidifying the soap in hot water to release fatty acids [26]. Ten grams of soap were dissolved in 150 ml of distilled water, heated, and then combined with 20 ml of 15% H_2SO_4 while continuing to heat until a clear solution formed [27]. To solidify the released fatty acids, 7 grams of beeswax were added, and the mixture was heated again. The solidified "cake" was removed, dried, and weighed. TFM was calculated using the formula: % TFM = (Weight of cake - Weight of wax) / Weight of soap × 100.

I. Moisture Content

The moisture content was determined by drying the soap to a constant weight. The soap's initial "wet weight" was recorded, and then it was dried in an oven at 100–115°C. After cooling, the final "dry weight" was recorded. The moisture content was calculated as: % Moisture Content = (Initial Weight - Final Weight) / Final Weight × 100.

III. RESULTS

The physicochemical properties of the soap, including color, odor, appearance, and pH, were evaluated. Additional parameters, such as foam height, foam retention, percentage free alkali, total fatty matter (TFM), moisture content, and alcohol-insoluble matter, were also measured. The results are presented in Table 1.

Sr. No.	Name of Test	Result
1	Colour	Dark Orange
2	Odour	Pleasant
3	Average Weight	65.23 gm
4	pH	11.26

IV. DISCUSSION

This study focused on formulating soap using ethanolic extracts of Ayurvedic varnya herbs. The resulting soap was a dry, stable solid with a consistent colour and pleasing appearance, producing foam without the addition of synthetic surfactants. With an estimated TFM of 76%, the soap qualifies as a Grade

V. CONCLUSION

The formulated herbal soap meets high commercial standards, with favorable results across all tested parameters. Therefore, it can be considered a standardized and promising natural alternative to commercial, chemical-based skin-whitening soaps.

DECLARATION STATEMENT

I must verify the accuracy of the following information as the article's author.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
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