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PREPARATION AND EVALUATION OF HERBAL SOAP CONTAINING ALOE VERA AND TEA TREE EXTRACT FOR SENSITIVE SKIN

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ABSTRACT

Herbal soaps have gained increasing attention as natural and safer alternatives to synthetic soaps due to their skin-friendly properties and minimal side effects. The present study was aimed at the formulation and evaluation of herbal soap using natural ingredients such as neem extract (*Azadirachta indica*), aloe vera (*Aloe vera*), and tea tree oil (*Melaleuca alternifolia*). The soap was prepared by the cold process method involving saponification of selected oils using sodium hydroxide, followed by incorporation of herbal ingredients, molding, and curing. The prepared herbal soap was evaluated for various physicochemical parameters including physical appearance, pH, foam height and retention, moisture content, total fatty matter (TFM), alcohol insoluble matter, hardness, skin irritation, and stability. The results indicated that the soap possessed desirable characteristics such as uniform appearance, acceptable pH, good foaming ability, adequate hardness, and stability. The formulation showed good cleansing properties, was easily washable, and did not produce any signs of irritation on the skin. The presence of herbal ingredients provided additional therapeutic benefits such as antimicrobial, anti-inflammatory, and moisturizing effects, making the formulation suitable for daily skin care. Overall, the developed herbal soap can be considered a safe, effective, and eco-friendly alternative to conventional soaps. Further studies are recommended to evaluate its long-term efficacy and commercial potential.

KEYWORDS: Herbal soap, neem (*azadirachta indica*), aloe vera (*aloe vera*), tea tree oil (*melaleuca alternifolia*), saponification.

INTRODUCTION

Overview of Herbal Cosmetics

Herbal cosmetics are formulations that incorporate plant-derived ingredients such as extracts, essential oils, and bioactive compounds for enhancing skin health and appearance. These products are gaining significant popularity due to their natural origin, safety, and minimal side effects compared to synthetic cosmetics. Herbal ingredients contain various phytoconstituents such as flavonoids, alkaloids, tannins, saponins, and essential oils that exhibit antioxidant, antimicrobial, anti-inflammatory, and moisturizing properties, making them highly beneficial for skin care applications. Additionally, herbal cosmetics are considered environmentally friendly and biodegradable, aligning with the growing demand for sustainable and eco-conscious products in the cosmetic industry.[1–4]

Importance of Herbal Soap

Herbal soaps play an essential role in maintaining skin hygiene, protection, and nourishment. Unlike conventional soaps, herbal soaps are formulated using natural oils, plant extracts, and herbal additives that not only cleanse the skin but also provide therapeutic benefits. They help in removing dirt, excess oil, and microorganisms from the skin surface while preserving the natural moisture balance. Herbal soaps enriched with ingredients such as neem, aloe vera, turmeric, and essential oils are known for their antibacterial, antifungal, soothing, and healing properties, making them suitable for various skin types, including sensitive and acne-prone skin. Furthermore, herbal soaps contribute to improving skin texture, preventing infections, and promoting overall skin health without causing irritation or dryness.[5–8]

Advantages over Synthetic Soaps

Herbal soaps offer several advantages over synthetic soaps, primarily due to their natural composition and absence of harsh chemicals. Synthetic soaps often contain artificial surfactants, preservatives, and fragrances, which may cause skin irritation, dryness, and allergic reactions, especially with prolonged use. In contrast, herbal soaps are formulated using mild and skin-friendly ingredients that help maintain the natural pH and lipid balance of the skin. They provide additional benefits such as deep cleansing, hydration, nourishment, and protection against environmental damage. Moreover, herbal soaps are generally free from toxic chemicals, making them safer for long-term use and suitable for individuals with sensitive skin. Their biodegradable nature also reduces environmental impact, making them a sustainable alternative to conventional cleansing products.[3,6,9,10]

Neem Leaves Extraction

Neem (*Azadirachta indica*) leaves are widely used in herbal formulations due to their potent antibacterial, antifungal, anti-inflammatory, and antiseptic properties. The extraction of neem leaves is commonly carried out using the maceration or solvent extraction method. Fresh or dried neem leaves are first washed thoroughly to remove impurities and then shade-dried to preserve their active constituents. The dried leaves are coarsely powdered using a grinder or mortar and pestle. The powdered material is then transferred to a suitable container, and an appropriate solvent such as ethanol, methanol, or distilled water is added in a specific ratio (commonly 1:10). The mixture is allowed to stand for 48–72 hours with occasional stirring to facilitate extraction of phytoconstituents such as flavonoids, tannins, and limonoids. After maceration, the mixture is filtered using muslin cloth or filter paper, and the filtrate is collected. The extract may be concentrated using a water bath and stored in an amber-colored container for further use in formulation.[11-13]

Aloe Vera Pulp

Aloe vera (*Aloe vera*) is a well-known medicinal plant widely used in skincare products for its soothing, moisturizing, healing, and anti-inflammatory properties. The pulp of aloe vera is obtained from fresh leaves of the plant. The leaves are first washed thoroughly with clean water to remove dirt and contaminants. The outer green rind is carefully removed using a sterile knife, and the inner transparent gel (pulp) is collected. This gel contains bioactive compounds such as polysaccharides, vitamins, enzymes, and amino acids that contribute to skin hydration and healing. The collected pulp is then homogenized to obtain a smooth consistency and can be filtered to remove fibrous material if required. The fresh aloe vera pulp is generally used immediately or stored under refrigeration to prevent degradation and microbial contamination.[12,14,15]

Essential Oil (Tea Tree Oil)

Tea tree oil is an essential oil obtained from the leaves of *Melaleuca alternifolia* and is widely recognized for its antimicrobial, antifungal, and anti-inflammatory properties. It is commonly extracted by the steam distillation method.

Fresh leaves of the plant are subjected to steam distillation, where steam passes through the plant material, causing the release of volatile oil components. The vapor mixture of steam and oil is then condensed and collected, after which the oil is separated from water. Tea tree oil contains active constituents such as terpinen-4-ol, cineole, and alpha-terpineol, which contribute to its strong antimicrobial activity. Due to its potent nature, tea tree oil is used in small concentrations in topical formulations to prevent skin infections, reduce inflammation, and promote healing. It is particularly useful in herbal soaps and creams designed for acne-prone and sensitive skin.[13,16,17]

METHODOLOGY

Materials Used

The materials used for the formulation of herbal soap were selected based on their cleansing, moisturizing, antimicrobial, and skin-protective properties. All ingredients were of pharmaceutical or cosmetic grade. The major materials included natural oils such as coconut oil, olive oil, and castor oil, which act as the base for soap formation.

Herbal ingredients such as neem leaf extract (*Azadirachta indica*), aloe vera gel (*Aloe vera*), and tea tree oil (*Melaleuca alternifolia*) were incorporated for their therapeutic properties. Sodium hydroxide (NaOH) was used as the alkali for saponification. Distilled water was used as a solvent, and natural colorants or fragrances were added to enhance the aesthetic appeal of the soap.

List of Ingredients and Their Roles

Table No. 1: List of Ingredients with their function.

Ingredient	Role
Coconut oil	Provides hardness and good lather
Olive oil	Moisturizing and conditioning agent
Castor oil	Enhances foam stability
Neem extract	Antibacterial and antifungal activity
Aloe vera gel	Soothing and moisturizing effect
Tea tree oil	Antimicrobial and anti-inflammatory agent
Sodium hydroxide (NaOH)	Alkali for saponification
Distilled water	Solvent for lye preparation
Natural color/fragrance	Improves appearance and acceptability

Method of Preparation of Herbal Soap

The herbal soap was prepared by the **cold process method**, which involves saponification of oils using an alkali solution followed by incorporation of herbal ingredients.

Figure 1: Extraction Process.

Selection of Oils and Herbal Ingredients

Appropriate oils such as coconut oil, olive oil, and castor oil were selected based on their ability to produce a soap with good cleansing, lathering, and moisturizing properties. Herbal ingredients such as neem extract, aloe vera gel, and tea tree oil were selected due to their antimicrobial, soothing, and skin-healing properties. All ingredients were accurately weighed before use.

Preparation of Lye Solution

A required amount of sodium hydroxide was carefully dissolved in distilled water to prepare the lye solution. This process was carried out with continuous stirring and proper safety precautions, as the reaction is highly exothermic. The lye solution was then allowed to cool to room temperature before further use.

Saponification Process

The selected oils were heated gently to melt and form a uniform oil phase. Once the oils and lye solution reached approximately the same temperature (around 35–40°C), the lye solution was slowly added to the oil phase with continuous stirring. The mixture was stirred until it reached “trace,” indicating the formation of a stable emulsion and the initiation of the saponification reaction.

Incorporation of Herbal Extracts

After reaching trace, herbal ingredients such as neem extract, aloe vera gel, and tea tree oil were added to the soap mixture. The mixture was stirred thoroughly to ensure uniform distribution of herbal constituents throughout the formulation. Care was taken to add these ingredients at a lower temperature to preserve their bioactive components.

Figure 2: Soap making procedure.

Molding and Curing

The prepared soap mixture was poured into molds and allowed to set for 24–48 hours. After solidification, the soap bars were removed from the molds and cut into desired shapes. The soaps were then cured for a period of 3–4 weeks in a cool and dry place to complete the saponification process and to enhance hardness and stability. After curing, the herbal soaps were ready for evaluation and use.

Figure 3: Moulding of Soap.

RESULT

1. Physical Appearance (Color, Odor, Texture)

The prepared herbal soap was evaluated visually for its physical characteristics such as color, odor, texture, and overall appearance. A small portion of the soap was observed under normal light conditions to check for uniformity, smoothness, and absence of cracks or surface irregularities. The odor was assessed for pleasantness and acceptability, while the texture was evaluated by touch to determine smoothness and consistency. A good herbal soap should be uniform in color, possess a pleasant natural fragrance, and have a smooth and firm texture.

2. pH Determination

The pH of the herbal soap was determined to ensure its compatibility with skin. About 1 g of soap was dissolved in 10 mL of distilled water to prepare a soap solution. The solution was stirred thoroughly and allowed to stand for some time. The pH was then measured using a digital pH meter. The ideal pH range for herbal soap is typically between 7 and 10, which ensures effective cleansing while minimizing skin irritation.

3. Foam Height and Foam Retention

Foaming ability is an important parameter for evaluating soap quality. A specific amount of soap solution was prepared and transferred into a measuring cylinder. The cylinder was shaken vigorously for a fixed number of times, and the foam height was measured immediately. Foam retention was determined by recording the foam height after a specific time interval (e.g., 5 minutes). Good herbal soap should produce adequate foam and retain it for a reasonable duration.

4. Moisture Content

Moisture content was determined to evaluate the stability and shelf life of the soap. A known weight of soap sample was taken and dried in an oven at a specified temperature until a constant weight was obtained. The loss in weight was calculated as the moisture content. Lower moisture content indicates better stability and longer shelf life of the soap.

5. Total Fatty Matter (TFM)

Total Fatty Matter (TFM) is an important quality parameter that indicates the amount of fatty substances present in soap. It was determined by standard analytical methods involving acidification and extraction of fatty matter. Higher TFM values indicate better quality soap with superior cleansing and moisturizing properties.

6. Alcohol Insoluble Matter

Alcohol insoluble matter was determined to evaluate the presence of impurities and non-soap substances. A known quantity of soap was dissolved in alcohol, and the insoluble residue was filtered, dried, and weighed. Lower alcohol insoluble matter indicates higher purity and better quality of the soap.

7. Hardness Test

The hardness of the soap was evaluated to determine its mechanical strength and durability. It was assessed either manually by applying pressure or using a hardness tester. A good herbal soap should have sufficient hardness to withstand handling and usage without breaking or deforming easily.

8. Skin Irritation Test

The skin irritation test was performed to ensure the safety of the herbal soap for topical use. A small amount of soap was applied to a patch of skin (usually on the forearm) and observed for 24 hours. The presence of redness, itching, or irritation was noted. A suitable herbal soap should be non-irritant and safe for all skin types.

CONCLUSION

The study successfully formulated and evaluated a herbal soap containing natural ingredients with proven skin benefits. The prepared soap exhibited satisfactory physicochemical properties, including appropriate pH, good foam formation, adequate hardness, and stability, indicating its suitability for daily use.

The incorporation of herbal ingredients such as neem, aloe vera, and tea tree oil enhanced the therapeutic value of the soap by providing antimicrobial, anti-inflammatory, soothing, and moisturizing effects. The formulation was found to be non-irritant and safe for skin application, making it a promising alternative to conventional synthetic soaps that may cause dryness or irritation.

Thus, the developed herbal soap can be considered a safe, effective, and eco-friendly skincare product. Further studies, including clinical evaluation and large-scale production, are recommended to establish its commercial feasibility and long-term benefits.

SUMMARY

The present study focused on the formulation and evaluation of herbal soap using natural ingredients with beneficial effects on skin health. Herbal components such as neem extract, aloe vera, and tea tree oil were incorporated due to their well-known antimicrobial, anti-inflammatory, and moisturizing properties. The soap was prepared by the cold process method involving saponification of selected oils using sodium hydroxide, followed by incorporation of herbal extracts, molding, and curing.

The prepared herbal soap was evaluated for various physicochemical parameters including physical appearance, pH, foam height and retention, moisture content, total fatty matter (TFM), alcohol insoluble matter, hardness, skin irritation, and stability. The results indicated that the soap possessed desirable characteristics such as uniform appearance, acceptable pH, good foaming ability, adequate hardness, and satisfactory cleansing properties. The formulation also showed low moisture content, acceptable TFM value, minimal impurities, and good stability under different storage conditions. The skin irritation test confirmed that the soap was safe and non-irritant for topical use.

Overall, the study demonstrated that herbal soap prepared using natural ingredients can provide effective cleansing along with additional therapeutic benefits, making it suitable for regular use.

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