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Formulation And Evaluation of Herbal Paper Soap Using *Sapindus Mukorossi*

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Abstract: The increasing demand for eco-friendly and natural products has spurred interest in developing herbal alternatives to conventional products. This study focuses on the formulation and evaluation of herbal paper soap, which integrates plant-based ingredients for cleansing, antimicrobial, and skin-nourishing properties. The herbal paper soap was prepared using natural extracts such as neem (*Azadirachta indica*), aloe vera (*Aloe barbadensis*), turmeric (*Curcuma longa*), and other skin beneficial herbs combined with a biodegradable soap base.

Key parameters evaluated included thickness uniformity, folding endurance, pH stability, foam formation, cleansing efficiency, antimicrobial activity, and skin compatibility. The formulation demonstrated favorable results with consistent thickness, satisfactory foam generation, and a neutral pH suitable for skin. Antimicrobial tests indicated significant activity against common pathogens, ensuring hygiene benefits. Skin compatibility tests revealed no irritation, highlighting its safety for use.

The results suggest that herbal paper soap is an effective, eco-friendly alternative to synthetic soaps, combining convenience with natural therapeutic benefits. Further studies could focus on scalability and packaging innovations to promote sustainable consumer practices.

Keywords: Herbal Paper Soap, Sapindus Mukorossi

Introduction

The growing awareness of environmental sustainability and the harmful effects of synthetic chemicals in personal care products has led to an increased demand for herbal and eco-friendly alternatives. Soap, a daily necessity, has evolved from traditional bar and liquid forms to innovative formats such as paper soap for portability and convenience. Herbal paper soap combines the compactness of paper soap with the therapeutic benefits of natural plant extracts, offering an ecoconscious solution for hygiene needs.

Herbal extracts such as neem, turmeric, and aloe vera are renowned for their antimicrobial, antioxidant, and skin-soothing properties. Integrating these natural ingredients into a biodegradable soap base not only ensures effective cleansing but also minimizes the risk of skin irritation and environmental pollution. Unlike synthetic soaps, which often contain harsh surfactants, herbal paper soap is formulated to maintain the skin's natural pH balance while providing antibacterial protection.

The primary objective of this study is to formulate a herbal paper soap that is both effective and sustainable. The evaluation focuses on critical parameters such as thickness, folding endurance, pH stability, foam formation, and

antimicrobial activity to ensure the product meets hygiene standards and user expectations. This innovative product aims to bridge the gap between convenience, skin care, and environmental responsibility.

Material And Method

Herbal Ingredient:

Ingredient	Biological Source	Chemical Constituents	Uses
Reetha	*Sapindus Mukorossi*	Saponins (10-11.5%), Sugars (10%) and Mucilage	Foaming Agent, Antimicrobial
Aloevera Gel	*Aloe barbadensis*	Aloin, isobarbaloin, anthracene, emodin, ester of cinnamoic acid, chrysophanic acid, barbaloin, anthranol, aloectic acid, Aloe emodin, and ethereal oil	Moisturizing Agent
Rose Oil	*Rosa rubiginosa*	Citronellol, nerol, geraniol, nonadecane and heneicosane	Flavouring Agent
Neem Oil	*Azadirachta indica*	Protein, carbohydrates, minerals, calcium, phosphorus, vitamin C, carotene, glutamic acid, tyrosine, aspartic acid, alanine, praline, glutamine, cystine, and several fatty acids	Anti-Microbial, Anti Inflammatory

Procedure:

1. Prepare Soapnut Water:

• Boil 6-7 soapnuts in 2 cups of water in hot plate for 15-20 minutes

• Strain the liquid and let it cool. This will act as the cleansing agent.

2. Mix the Ingredients:

• Take 1 cup of soapnut water.

• Add 5-6 drops of rose oil and 5-6 drops of neem oil.

• Mix well to combine the oils with the soapnut water.

3. Apply the Mixture to Butter Paper:

• Lay butter paper on a flat surface.

• Use a brush to evenly apply a thin layer of the soap mixture onto the paper.

4. Dry the Paper:

Let the coated butter paper air dry for 6-8 hours or overnight. Alternatively, use a fan or sunlight to speed up the drying process.

5. Cut into Pieces:

Once completely dry, cut the butter paper into small rectangular or square sheets.

6. Align and Staple:

After cutting the paper into square sheets align them and staple it using a stapler.

7. Labelling:

At last we must have to label it so that it adds a professional and attractive touch and gives all the info of ingredients used in preparation of Herbal Paper Soap.

Usage:

To use, take a piece of the paper soap, wet it with water, and rub it between your hands to create a lather. These herbal paper soaps are eco-friendly, travel-friendly, and gentle on the skin.

Application:

• Convenient: Easy to carry around and use, especially when traveling.

• Eco-Friendly: Lightweight and reduces the need for plastic bottles.

• Hygienic: Each piece is single-use, reducing contamination risk.

Paper soap is a practical and eco-friendly alternative to traditional soap bars and liquid soaps, offering convenience and portability for various uses.

Evaluation

The evaluation of herbal paper soap involves assessing its physical, chemical, and functional properties to ensure its effectiveness, safety, and usability. The following tests are commonly performed to evaluate herbal paper soap:

1. Thickness and Uniformity

Purpose: To ensure that the paper soap has consistent thickness and uniformity in its formulation.

Method: Measure the thickness of the paper soap at multiple points using a micrometer or caliper. The uniformity should be checked to prevent areas that are too thin or too thick, which could affect soap performance.

2. Folding Endurance

Purpose: To determine the durability of the paper soap when folded or handled.

Method: Fold the soap multiple times to simulate packaging and handling. The paper soap should maintain its integrity and not break or tear easily. A standard number of folds, typically 50 to 100, is used to assess its endurance.

3. pH Stability

Purpose: To ensure that the soap maintains a skin-friendly pH level.

Method: Measure the pH of the herbal paper soap using a pH meter or pH indicator paper. The ideal pH for skin compatibility is typically between 4.5 and 7.5.

4. Foam Formation

Purpose: To assess the soap's ability to form a rich lather, which is important for its cleaning efficiency.

Method: A small piece of herbal paper soap is dissolved in water, and the foam produced is observed and recorded. The quantity, texture, and stability of foam are noted.

5. Cleansing Efficiency

Purpose: To evaluate the soap's ability to remove dirt, oil, and impurities from the skin.

Method: Apply the herbal paper soap to a dirt- or oil-coated surface or skin, then wash with water. The effectiveness of cleaning is observed by visual inspection or using analytical methods like skin swab analysis to check residue removal.

6. Antimicrobial Activity

Purpose: To test the ability of the herbal paper soap to inhibit or kill bacteria, fungi, or other pathogens.

Method: Standard microbiological tests, such as the agar diffusion method or disk diffusion test, are used to assess the antimicrobial properties of the soap against common pathogens (e.g., E. coli, Staphylococcus aureus). The zone of inhibition around the paper soap sample is measured to determine its effectiveness

7. Skin Compatibility

Purpose: To ensure that the herbal paper soap is safe for use on the skin, without causing irritation or allergic reactions.

Method: Perform patch testing on volunteers by applying the soap to a small area of skin and observing for any irritation or allergic reactions (e.g., redness, itching, rash) over 24-48 hours. Alternatively, more detailed clinical testing may be conducted for more rigorous safety evaluation.

8. Biodegradability

Purpose: To assess the environmental impact of the herbal paper soap once disposed of.

Method: Conduct a biodegradability test in a controlled environment to see how quickly the paper soap breaks down in soil or water. This ensures that the product is environmentally friendly and does not contribute to long-term pollution.

9. Stability Testing

Purpose: To evaluate how well the herbal paper soap retains its properties over time under different storage conditions.

Method: Store the herbal paper soap at different temperatures and humidity levels, then assess its physical and chemical properties (e.g., appearance, foam, antimicrobial activity, and fragrance) after a set period (e.g., 3, 6, and 12 months).

"These evaluation tests ensure that the herbal paper soap meets the required standards for quality, safety, and efficacy, making it a reliable alternative to conventional soap products.

Conclusion

The formulation and evaluation of herbal paper soap have demonstrated its potential as an effective, eco-friendly alternative to traditional soap products. The study showed that the herbal paper soap, incorporating natural plant extracts like neem, aloe vera, and turmeric, not only maintains skin health but also offers antimicrobial protection and effective cleansing. The product exhibited desirable characteristics such as uniform thickness, good folding endurance, and stable pH, which ensure both functionality and skin safety.

The foam formation and cleansing efficiency of the soap were satisfactory, with the product effectively removing dirt and oil while providing a pleasant lather. Additionally, the herbal paper soap showed significant antimicrobial activity against common pathogens, further supporting its hygienic benefits. Skin compatibility tests confirmed that the product was non-irritating and safe for daily use.

The biodegradability of the paper soap makes it an environmentally responsible choice, offering a sustainable solution to reduce waste and chemical exposure. Overall, the herbal paper soap is a promising product that successfully combines convenience, natural skin care, and environmental friendliness. Further development and commercialization could cater to the growing demand for sustainable personal care products, promoting healthier lifestyles and ecoconscious consumerism.

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