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Research Article

Abaca (Musa textilis)

Formulation, Physico-chemical and Consumer Evaluation of Abaca (Musa textilis) Pseudostem Extract Face Serum

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This study aimed to formulate and evaluate a face serum incorporating varying concentrations (0%, 1%, 3%, and 5%) of abaca (Musa textilis) pseudostem extract, focusing on its physico-chemical properties and consumer acceptability. Abaca, known for its antioxidant and antimicrobial potential, presents a promising natural ingredient for cosmetic applications. Four serum formulations were developed and assessed for pH, viscosity and specific gravity. A sensory evaluation involving 30 panelists was conducted to assess consumer preferences based on appearance, aroma, skin feel and overall acceptability. The 5% abaca extract formulation showed optimal balance between functionality and consumer acceptability, scoring highest in overall preference. These findings suggest that abaca pseudostem extract is a viable ingredient in natural skincare formulations, offering beneficial properties with high user acceptability.

Keywords: abaca (Musa textilis), face serum, physico-chemical properties, consumer acceptability

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1. Introduction

The pursuit of natural and effective skincare products has become a growing trend in the cosmetics industry, driven by increasing consumer demand for safer and environmentally friendly alternatives to synthetic ingredients. One such natural resource gaining attention for its therapeutic properties is abaca (*Musa textilis*), a banana species native to the Philippines. Historically valued for its fibers, abaca is now being recognized for its potential benefits in skincare formulations due to its antioxidant, anti-inflammatory, and moisturizing properties.

This research explores the formulation and physico-chemical evaluation of abaca extract-based face and body creams, aiming to harness its active compounds to create a product with promising skincare benefits. By integrating abaca extract into a topical formulation, the study seeks to evaluate the serum's effectiveness in providing hydration, improving skin texture, and offering protection against environmental stressors. Additionally, the physico-chemical properties of the serum, such as stability, pH, viscosity, spreadability, and sensory properties, will be thoroughly examined to ensure its safety and efficacy for daily use.

The results of this research will contribute to the development of innovative, plant-based skincare products that combine the rich heritage of local resources with modern cosmetic science, potentially paving the way for more sustainable and eco-friendly skincare solutions.

2. Research Methodology

The study employed developmental, quantitative and experimental method of research. It was developmental since it aimed to develop a product utilizing abaca which is abundant in the locality. It was quantitative because the study attempted to quantify the result of the consumer acceptability level of the product. It employed experimental method of research since different treatments/formulations were utilized in the production of the product.

The Research and Development Services Building at Catanduanes State University in Calatagan, Virac, Catanduanes was the site of the experiment.

The units of analysis for this study include the abaca plant (*Musa textilis*), the primary raw material for the formulation of the face serum. The abaca pseudostem extract was examined for their extractable compounds and their potential efficacy in the formulation of the serum. The formulated face serum was analyzed as the main output of the study. Different concentrations of abaca extract were tested in the serum for optimal performance, focusing on its stability, efficacy, and safety. The formulation underwent evaluation to assess various physico-chemical properties, such as pH, viscosity and specific gravity. Consumer acceptance level testing (in terms of appearance, aroma, skin feel and overall acceptability) was conducted to end users or individuals (30 respondents) who would potentially use the face serum.

3. Results and Discussion

3.1 Formulation of the Facial Serum

Formulating a face serum involves combining active ingredients with a suitable base to target specific skin concerns like hydration, anti-aging, brightening, or acne. A good formulation is stable, effective, non-irritating, and cosmetically elegant. Table 1 shows the percentage composition of the components of the abaca face serum.

Table 1: Percentage composition of the components of the face serum.

Ingredients	Treatment 0	Treatment 1	Treatment 2	Treatment 3
Abaca extract	0.0%	1.0%	3.0%	5.0%
Aloe vera gel	55.0%	55.0%	55.0%	55.0%
Argan oil	10.0%	10.0%	10.0%	10.0%
Glycerin	25.0%	25.0%	25.0%	25.0%
Phenoxyethanol & Caprylyl Glycol & Sorbic acid	1.0%	1.0%	1.0%	1.0%
Fragrance	1.0%	1.0%	1.0%	1.0%
Distilled water	Qs to 100%	Qs to 100%	Qs to 100%	Qs to 100%

3.2 Physico-Chemical Properties

3.2.1. pH

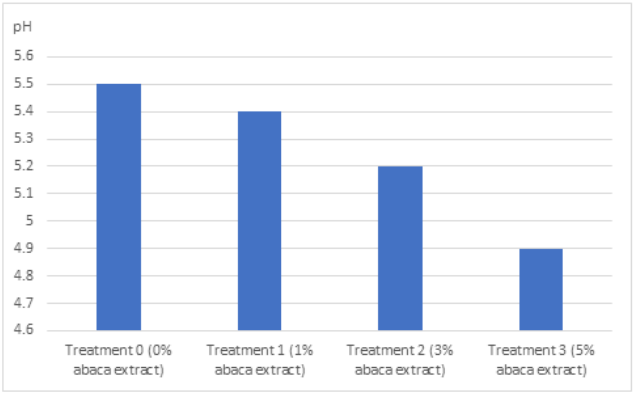

Figure 1: pH of face serum utilizing 0%, 1%, 3% and 5% abaca pseudostem extract.

pH is a critical factor in skincare formulations. It influences skin compatibility (ideal pH for facial skin is ~5.0–5.5). It affects the stability and efficacy of both active ingredients and preservatives. Natural extracts like abaca pseudostem can shift the pH depending on their acidic or basic phytochemical profile.

It was observed that acidity increases with concentration. As abaca pseudostem extract concentration rises, **natural phenolic acids** contribute more to the overall acidity of the serum.

3.2.2. Viscosity

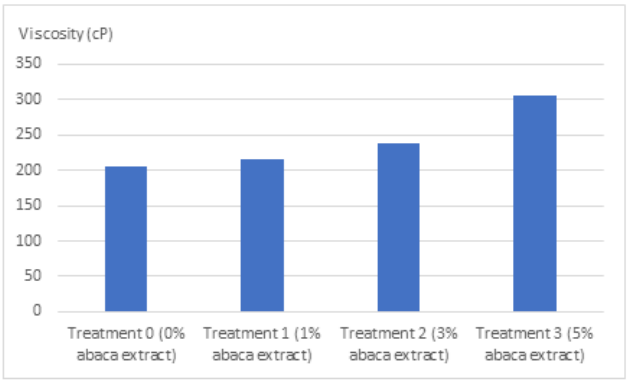

Figure 2: Viscosity of face serum utilizing 0%, 1%, 3% and 5% abaca pseudostem extract.

Viscosity refers to a serum's resistance to flow. It is critical for sensory feel (lightweight vs. heavy), spreadability, stability and absorption rate. The ingredients, particularly the actives and polymers like plant extracts, influence viscosity.

The pseudostem of abaca (*Musa textilis*) contains polysaccharides (like cellulose and hemicellulose), phenolic compounds and other hydrophilic bioactives.

These components can act as natural thickeners (especially polysaccharides), bind water, forming a hydrated matrix that increases viscosity and interact with gelling agents in the formulation. Treatment 1 (**1% abaca pseudostem extract) l**ikely has **minimal impact** on viscosity. The polysaccharide content is low, so the serum remains **fluid/lightweight**. It is best for **watery, fast-absorbing serums**. Treatment 2 (**3% abaca pseudostem extract) has a slightly n**oticeable **increase in viscosity**. There is enough polysaccharides to start forming a weak gel-like network which results in a **silky or slightly thickened texture** and good balance between sensory feel and stability. Treatment 3 (**5% abaca pseudostem extract) has s**ignificantly **higher viscosity**. It produced a **gel-like or more viscous serum**. This has an effect on the spreadability of the serum which may leave a slightly tacky feel unless balanced with emollients or humectants.

3.2.3. Specific Gravity

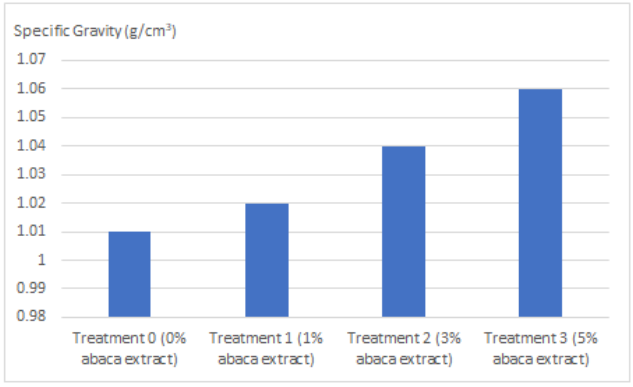

Figure 3: Specific gravity of face serum utilizing 0%, 1%, 3% and 5% abaca pseudostem extract.

Specific gravity (SG) is the ratio of the density of a substance (e.g. face serum) to the density of water at a specified temperature (typically 25°C).

Abaca (*Musa textilis*) pseudostem extract contains polysaccharides, phenolics, and other bioactive compounds. These contribute to increased solute content (solids in the formulation), higher viscosity and slight increase in density, and thus, specific gravity. Higher SG may correlate with increased viscosity, which can improve or impair **serum spreadability and absorption.** A slightly higher SG may be desirable for serums meant to feel rich and hydrating. Too high SG might affect sensory feel or layer poorly under makeup.

3.3 Consumer Survey Results

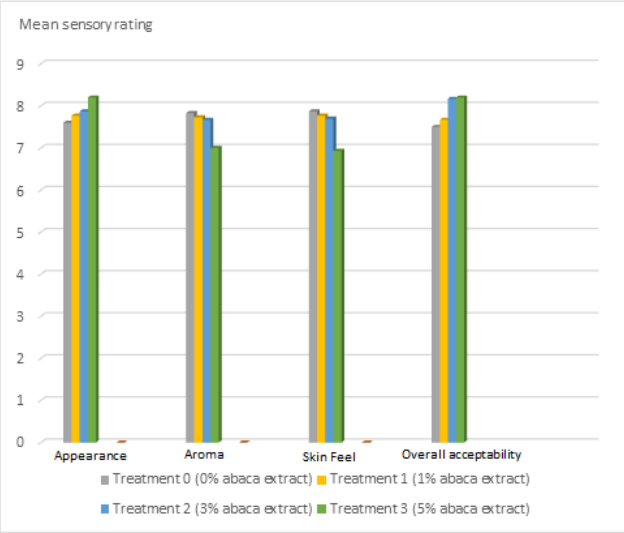

Figure 4: Mean sensory ratings of face serum utilizing 0%, 1%, 3% and 5% abaca pseudostem extract.

For appearance, Treatment 3 (5% abaca extract) had the **highest score (8.20)**, significantly different from other treatments, suggesting that a higher concentration of abaca extract enhanced visual appeal. Treatments 0, 1 & 2 had similar appearance scores with no significant differences among them.

For aroma, all treatments except Treatment 3 had similar aroma scores (**no significant difference). Treatment 3** had a **significantly lower aroma score (7.00),** indicating that higher abaca extract may negatively affect aroma perception.

For **skin feel, s**cores **declined progressively** as abaca extract concentration increased. Each treatment had a **statistically distinct** skin feel score, suggesting a clear negative impact of abaca extract on this parameter.

For overall acceptability, highest scores at 3% abaca extract (8.17) and 5% abaca extract (8.20), both suggesting excellent acceptability. While 5% abaca extract had a significantly better acceptability than the others, 3% was not statistically different from the lower concentrations. Despite the drop in skin feel and aroma, 5% abaca extract boosted overall user perception, likely due to superior appearance and possibly perceived efficacy.

5% abaca extract (Treatment 3) received the highest scores for appearance and overall acceptability, despite lower aroma and skin feel. This indicates that visual appeal and perceived benefits may outweigh minor sensory drawbacks. 3% abaca extract (Treatment 2) provides a good compromise: high acceptability, good appearance, and less negative impact on aroma and skin feel than 5%.

4. Conclusions and Recommendations

The present study successfully formulated face serums containing varying concentrations (0%, 1%, 3%, and 5%) of abaca (*Musa textilis*) pseudostem extract and evaluated their physico-chemical properties and consumer acceptability level. The results revealed that all formulations maintained acceptable parameters in terms of pH, viscosity and specific gravity, indicating their suitability for topical application.

The increasing concentration of abaca extract positively influenced the serum's clarity and functional properties, suggesting its potential as a beneficial natural ingredient in skincare products. Among all, the 3% and 5% formulations were found to be most effective in balancing desirable physico-chemical qualities with enhanced consumer acceptance.

Overall, abaca pseudostem extract shows promise as a valuable component in cosmetic formulations, particularly as a natural, plant-based active for face serums. Further studies on long-term stability, skin compatibility, and clinical efficacy are recommended to fully explore its dermatological benefits and commercial potential.

Based on the results of the study, the following are recommended:

1. Conduct further studies to determine the optimal concentration of abaca pseudostem extract by balancing its beneficial effects (e.g., antioxidant, anti-inflammatory, moisturizing) with product stability and skin compatibility.
2. Supplement the physico-chemical evaluation with **antioxidant assays** (e.g., DPPH, ABTS), **antimicrobial testing**, and **cell-based assays** (if feasible) to validate the skin benefits of abaca extract. Demonstrating biological activity will support the claim that abaca extract contributes functional benefits to the skin serum beyond cosmetic appeal.

3. Conduct **accelerated stability testing** (e.g., 40°C/75% RH for 3–6 months) on all formulations to observe changes in physico-chemical properties and microbial growth. Stability over time is crucial for product shelf life and regulatory approval.
4. Perform a **cost-benefit analysis** of sourcing and extracting abaca pseudostem at larger scales and assess scalability of the formulation process. Sustainable sourcing and economic viability will influence product launch decisions.

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