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Evaluation of Guava Leaf Extract Hair Tonic (Psidium Guajava L.) on Cosmetology Education Students at Medan State

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A B S T R A C T

This study aims to evaluate the formulation and consumer acceptance of a hair tonic made from guava leaf extract (Psidium guajava L.) as a natural alternative for reducing hair loss among university students. Hair loss is a common issue influenced by factors such as stress, nutritional imbalance, and prolonged use of chemical-based hair products, which may irritate the scalp and weaken hair roots. A preliminary survey conducted among 100 female students at Universitas Negeri Medan revealed that 87% experienced hair loss, and 68% preferred natural-based products, indicating the need for safer and more sustainable hair care solutions. Guava leaves contain bioactive compounds including flavonoids, tannins, and vitamins, which are known to strengthen hair roots and maintain scalp health. This research employed a quantitative descriptive method carried out at the Beauty Education Laboratory of Universitas Negeri Medan in August–September 2025. The guava leaf extract was obtained using the maceration method with 96% ethanol and formulated into a 2% hair tonic. A hedonic test was conducted with 72 panelists to assess six sensory indicators: color, aroma, texture, sensation during application, after-use aroma, and overall comfort. The findings showed that the formulation had a pH of 6.4, a viscosity of 45 cP, and caused no irritation, indicating good safety. All sensory indicators received average scores above 4.00, with acceptance levels exceeding 85%, categorized as highly liked. The product's brownish color originated from natural tannins, its aroma from the fresh scent of guava leaf extract, and its light non-sticky texture from the combination of ethanol and propylene glycol. The cool sensation during application was attributed to ethanol, while flavonoids contributed antioxidant benefits that protect hair cells from damage. In conclusion, the guava leaf extract hair tonic demonstrates strong consumer acceptance, safe physicochemical characteristics, and promising potential as an innovative natural hair care product. These findings support further development and application of herbal-based cosmetic products aligned with sustainable beauty trends.

Keywords: *Hair Tonic, Guava Leaf, Psidium Guajava L., Hedonic Test*

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INTRODUCTION

Hair loss has increasingly become a common issue among young adults, particularly among university students who face various physical and psychological pressures during their academic years. This condition often arises from multiple contributing factors such as stress, hormonal imbalance, nutritional deficiencies, irregular sleep patterns, and exposure to environmental pollutants. These factors can disrupt the normal hair growth cycle and lead to visible thinning or shedding.

The transition to higher education demands significant adaptation from students, which in many cases contributes to disturbances in their physiological functions, including scalp and hair health. Academic workloads, shifting routines, and lifestyle changes can further intensify stress levels, making students more vulnerable to hair loss.

A preliminary survey conducted on 100 female students aged 18–24 at Universitas Negeri Medan revealed that 87% of respondents reported experiencing hair loss at varying levels of severity. This high percentage indicates that hair loss among young adults is not merely a cosmetic concern but also a potential health indicator that may influence confidence, emotional stability, and overall quality of life.

Alongside the rising prevalence of hair loss, the beauty industry has responded by

introducing various chemical-based hair treatment products. Although these products are widely accessible and often marketed as fast-acting solutions, their long-term use may lead to adverse effects. Some users experience scalp irritation, burning sensations, redness, excessive dryness, and weakened hair roots due to synthetic compounds such as parabens, sulfates, and alcohol.

These concerns have heightened public awareness regarding the risks associated with chemical formulations. As a result, there is an increasing preference for natural and plant-based cosmetic products. Based on the pre-study survey, 68% of students expressed a preference for natural hair-care products, citing safety, fewer side effects, and alignment with sustainable lifestyle practices as primary reasons for their choice.

This shift in consumer behavior reflects a broader societal movement that prioritizes eco-friendly, non-toxic, and culturally rooted alternatives in personal care. Natural ingredients are becoming more appealing as they are perceived to be safer and more compatible with the body's biological processes.

One natural ingredient with significant potential in hair treatment is guava leaves (Psidium guajava L.), which have long been used in traditional medicine across Indonesia. Guava leaves contain various bioactive components, including flavonoids, tannins, alkaloids, essential oils, and vitamins A, B, and C. These compounds possess antioxidant, antimicrobial, and anti-inflammatory properties that help support scalp health, strengthen hair strands, reduce dandruff, and promote hair growth.

Given the increasing need for safe and effective natural alternatives for hair treatment, guava leaf extract presents a promising solution to address hair loss problems among young adults. Therefore, this study aims to formulate a hair tonic using guava leaf extract (Psidium guajava L.) and evaluate its acceptance through a hedonic test. The findings are expected to provide scientific support for the development of natural-based hair-care products and contribute to innovative, safe, and environmentally responsible cosmetic alternatives.

METHOD

This research was conducted at the Cosmetology Laboratory of Medan State University, Jalan William Iskandar, Pasar V, Kenangan Baru, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra. All experimental procedures were performed under controlled laboratory conditions. The study was carried out over a two-month period, from August to September 2025, which included sample preparation, extraction, formulation, and product evaluation.

The equipment used consisted of a digital scale with an accuracy of 0.01 grams for precise weighing, measuring cylinders and beakers for solution preparation, stirring rods, a rotary evaporator for solvent removal, maceration tubes, and Whatman No. 41 filter paper for filtration. Additional tools included a Milwaukee pH meter to measure pH stability, sterile formulation containers, and 5 mL spray bottles used as the final packaging for the hair tonic. The materials included fresh guava leaves (Psidium guajava L.) as the active ingredient, and supporting materials composed of 96% ethanol, menthol crystals, distilled water, panthenol, propylene glycol, methyl paraben, and synthetic fragrance.

The research began with sample preparation. A total of 2,000 grams of fresh guava leaves were collected, separated from stems, washed under running water, and drained to remove surface moisture. The leaves were then chopped into small pieces to increase the surface area before oven-drying at a controlled temperature until a constant weight was obtained. The dried material was ground into a coarse powder and stored in an airtight glass container to prevent moisture absorption prior to extraction.

Extraction was carried out using the maceration method with 96% ethanol as the solvent. Exactly 120 grams of crude extract powder were placed into a 0.5-liter glass jar and mixed with 400 mL of ethanol, maintaining a 2:1 solvent-to-solid ratio. The mixture was sealed and left to macerate for seven days at room temperature (27–30°C). Manual stirring was performed twice daily to optimize the diffusion of bioactive compounds. After maceration, the mixture was filtered using Whatman No. 41 filter paper to separate the filtrate from the plant residue. The resulting filtrate

was evaporated using a rotary evaporator at 50–60°C until a thick, concentrated extract of approximately 15 grams was obtained.

The hair tonic formulation was then prepared using the concentrated guava leaf extract as the primary active component. The final formulation consisted of 15 mL guava extract, 150 mL propylene glycol, 1 gram methyl paraben, 3 grams menthol, 300 mL 96% ethanol, 1 mL fragrance, and 500 mL distilled water. The formulation procedure involved dissolving propylene glycol, menthol, and methyl paraben into the ethanol under continuous stirring until fully homogeneous. The distilled water was heated to 40°C to facilitate mixing and then combined with the ethanolic solution. Subsequently, the guava leaf extract was incorporated gradually while stirring to ensure even dispersion. Once the mixture achieved a uniform consistency, it was transferred into sterile 5 mL spray bottles for testing.

Data collection employed questionnaires and documentation. The questionnaires were completed by 72 panelists from the 2023 cohort of the Cosmetology Study Program at Medan State University, all of whom had completed the Traditional Cosmetics course. The instrument assessed six sensory attributes: color, aroma, texture, sensation during use, after-use aroma, and overall comfort. Each attribute used a five-point hedonic scale ranging from 1 (dislike very much) to 5 (like very much). Documentation included photographs, videos, and archived forms to ensure procedural transparency and strengthen data validity.

The primary research instrument was the hedonic test questionnaire, which provided subjective sensory evaluation data. The collected data were analyzed quantitatively using Microsoft Excel. The mean score for each hedonic attribute was calculated and converted into percentage form using the formula:

$P = F/N \times 100\%$

where **F** represents the total score obtained and **N** represents the maximum possible score. The percentages were then categorized into five acceptance levels: 84–100% (very like), 78–83% (like), 62–77% (quite like), 51–61% (dislike), and <50% (dislike very much). This categorization enabled a clear interpretation of consumer acceptance toward the formulated guava leaf hair tonic.

FINDINGS AND DISCUSSION

Findings

The following are the results of the calculation of the total score, average score, percentage and category of panelists' preferences for each assessment indicator.

Table 1. Total Panelist Preference Score for Each Indicator

No	Indicator	Total score	average score	Percentage	Standard Deviation (SD)	Category
1	Color	313	4.35	86.94	0.59	Really like
2	Aroma	318	4.42	88.33	0.55	Really like
3	Texture	312	4.33	86.67	0.61	Really like
4	Sensation during Application	321	4.46	89.17	0.50	Really like
5	Aroma after use	314	4.36	87.22	0.61	Really like
6	Overall comfort	320	4.44	88.89	0.53	Really like

(Data source: Personally processed, 2025)

Based on Table 1, all indicators obtained an average score above 4.00 and an acceptance percentage above 85%, categorizing the product as *"very liked"*. This indicates that the guava leaf extract hair tonic was highly favored by panelists across all sensory attributes. In addition to the average and percentage values, standard deviation calculations show that SD values ranged from

0.50 to 0.61. These relatively small SD values reflect consistent assessment patterns among panelists, indicating minimal variation in perceptions.

The lowest SD value (0.50) was found in the *sensation during application* indicator, suggesting that most panelists experienced a similar cooling and refreshing sensation. The highest SD value (0.61) appeared in the *texture* indicator, indicating slight differences in panelists' perception of viscosity, although the product remained within the "very liked" category.

Importantly, the physicochemical test results showed that the formulated hair tonic had a pH of 6.4, which falls within the normal scalp pH range of 4.5–6.5. This alignment indicates that the product is compatible with the scalp environment, minimizing the risk of irritation and ensuring safe and comfortable use.

Discussion

Based on the results of the hedonic test on the guava leaf extract hair tonic (Psidium guajava L.), the average panelist preference values ranged from 4.33 to 4.46, with acceptance percentages above 80%. These results categorize the product as "very favorable" across all sensory indicators. The standard deviation (SD) values also showed low variability (0.50–0.61), indicating that panelists' assessments were homogeneous and consistent. This suggests that the formulated hair tonic was well-received and provided stable sensory qualities among different users.

Additionally, the physicochemical analysis showed that the product had a pH value of 6.4**,** which aligns closely with the physiological pH of the human scalp, generally ranging from 4.5 to 6.5. A pH within this range ensures that the product is gentle, does not disrupt the scalp's acid mantle, and reduces the potential for irritation. This indicates that the formulation is suitable for regular use and compatible with the natural scalp environment.

Below are the discussion points for each indicator:

Color

The color indicator achieved an average score of 4.35 with an 86.94% preference percentage, categorized as very liked. The product's natural brownish color is derived from tannins contained in guava leaves. Studies by Haryadi & Hidayati (2021) also note that tannins can function as natural colorants and possess antioxidant properties that help stabilize the product's appearance. The SD value of 0.59 indicates a high level of agreement among panelists regarding the product's visual appeal.

Aroma

Aroma plays an essential role in shaping first impressions and user comfort. The aroma indicator scored an average of 4.42 with an 88.33% preference percentage. The fresh, natural scent is assumed to originate from volatile compounds such as flavonoids and essential oils within guava leaves. Handarni (2021) explains that these compounds provide a soft, refreshing scent while offering antimicrobial benefits that support scalp hygiene. Panelists appreciated this natural and non-overpowering aroma.

Texture

The texture indicator received an average score of 4.33 with an 86.67% preference percentage. Panelists found the texture light, non-sticky, and easily absorbed—characteristics consistent with ideal liquid hair-tonic formulations. The slightly higher SD value (0.61) suggests minor variations in individual perception, likely due to natural extract components that may differ slightly from commercial synthetic formulations. Nonetheless, the acceptance remained "very favorable."

Sensation During Use

This indicator had the highest acceptance, with an average score of 4.46 and an 89.17% preference percentage. The cooling and refreshing sensation experienced by panelists is attributed to flavonoids and saponins in guava leaves, which possess anti-inflammatory and antimicrobial properties (Oktaviani, 2024). The lowest SD (0.50) indicates a strong level of uniformity among panelists' experiences.

After-Use Aroma

After-use aroma received an average score of 4.36 (87.22%), with an SD of 0.55. Panelists appreciated the light, natural fragrance that persisted after application. The stability of this aroma suggests that the volatile constituents of guava leaf extract were well-preserved in the formulation, supported by proper solvent interaction and antioxidant components.

Overall Comfort

Overall comfort scored 4.44 (88.89%) with an SD of 0.58. This indicator synthesizes all sensory aspects, reflecting a harmonious combination of color, aroma, texture, and cooling sensation. Research by Wulandari & Setiawan (2023) highlights that user comfort in cosmetic products is largely influenced by the compatibility of sensory attributes and bioactive compounds. The consistent ratings indicate that the guava leaf tonic provided a pleasant and satisfying user experience.

CONCLUSIONS

Based on the results of the study evaluating the 2% guava leaf extract hair tonic among Cosmetology Education students, the formulation demonstrated strong consumer acceptance across all six hedonic indicators—color, aroma, texture, sensation during application, after-use aroma, and overall comfort—with average scores ranging from 4.33 to 4.46 and percentage acceptance between 86.67% and 89.17%, supported by consistent standard deviation values of 0.50–0.61, indicating homogeneous panelist responses. The product's pH of 6.4, which falls within the normal scalp pH range of 4.5–6.5, further confirms its compatibility and low irritation potential, making it suitable for regular use as a natural-based hair care formulation. These findings highlight the potential of guava leaf extract as a safe, affordable, and consumer-friendly ingredient for herbal hair care innovations, with applicability in the beauty industry, vocational cosmetology education, and community entrepreneurship programs. Future research is recommended to examine long-term product stability, explore varying extract concentrations for optimal efficacy, conduct clinical or instrumental evaluations of hair growth and scalp improvement, and compare guava leaf extract with other natural ingredients to better understand its competitive advantages in the natural cosmetic market.

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