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FORMULATION AND ACCEPTABILITY OF SHINY BUSH-BETEL LEAF HAND SOAP STRIP

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Abstract: The shiny bush-betel leaf hand soap strip is an innovative plant-based hygiene product designed to provide a portable, convenient, and effective alternative to traditional hand soaps. This study addressed the increasing demand for natural and travel-friendly hygiene products by evaluating the acceptability and effectiveness of shiny bush-betel leaf extract hand soap strips in terms of sensory qualities and functional performance. An experimental-development research design using a Complete Randomized Design (CRD) was employed with three treatments (3) that differed in the proportion of the main ingredients: Treatment A (25 ml shiny bush and 75 ml betel leaf), Treatment B (50 ml shiny bush and 50 ml betel leaf), and Treatment C (75 ml shiny bush and 25 ml betel leaf). The glycerin soap base, foam booster, glycerin, and scent were kept constant across all treatments. A total of 25 evaluators, including cosmetology teachers, beauticians, students, and consumers, assessed the products using a 5-point Likert scale based on appearance, foaming ability, scent, texture and functional performance in terms of moisturizing and smoothing effect.

Findings revealed that Treatment C was consistently rated superior across all sensory and functional attributes. In terms of appearance, it was described as very attractive; its foaming ability was very foamy; its scent was very pleasant and its texture was very fine, providing a gentle effect. Treatment C obtained the highest mean scores, being rated as very hydrating in terms of moisturizing effect and 'smooth' in smoothing effect. Treatments A and B were likewise rated as smooth in smoothing effect, while their moisturizing performance ranged from moderately hydrating to hydrating. Moreover, general acceptability was rated as effective across all treatments. Statistical analyses confirmed significant differences among the treatments in sensory qualities using the Kruskal–Wallis test and in smoothing and moisturizing effects through one-way ANOVA. Post hoc evaluation indicated that the higher shiny bush content in Treatment C contributed to improved texture, superior hydration, and overall user satisfaction, while the smoothing effect and general acceptability, although descriptively higher Treatment C did not show statistically significant differences. The study concluded that the shiny bush-dominant formulation was the most effective and acceptable treatment, highlighting the importance of proper ingredient proportioning in developing plant-based hand care products.

Keywords: Shiny Bush, Betel Leaf, Hand Soap, Strips, Plant-Based Hand Soap Strip

I. INTRODUCTION

Regular handwashing with soap is a simple yet highly effective practice for maintaining hygiene and preventing disease. Studies show that individuals who use soap have a significantly lower risk of diarrheal infections compared to those who do not (Curtis & Cairncross, 2014). Portable alternatives, such as strip soap, provide the same hygiene benefits while offering convenience and accessibility, reinforcing the importance of consistent handwashing for public health. However, not all soaps affect the skin in the same way. Antibacterial soaps, which contain active antimicrobial agents, can alter the skin's natural microbial balance. In a study among a rural population in Madagascar, Yu et al. (2018) found that while antibacterial soaps did not reduce overall microbial richness, they shifted the composition of the skin's bacterial community for at least two weeks after use. Frequent use of harsh or surfactant-rich soaps may disrupt the skin's acidic barrier and microbiome, potentially causing dryness, irritation, microbial imbalance, and increased susceptibility to skin disorders.

According to Geyer, Jambeck, and Law (2017), (SDG) the growing concern over pollution, plastic waste, and chemical toxicity has increased global demand for environmentally sustainable personal care products. Traditional liquid hand soaps, commonly packaged in single-use plastic bottles, contribute significantly to landfill accumulation and marine pollution. These environmental issues have encouraged researchers, consumers, and manufacturers to explore sustainable alternatives such as strip hand soap, also known as soap strips or paper soap, which provides a low-waste and eco-friendly hand hygiene solution (Geyer et al., 2017). Recent discussions on sustainable hygiene products indicate that hand soap strip is emerging as an environmentally responsible alternative to conventional liquid hand soaps packaged in plastic

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bottles (Bufin, 2021). Traditional hand soaps contribute significantly to plastic waste due to low recycling rates and prolonged decomposition, leading to accumulation in landfills and marine environments. In contrast, strip hand soap consists of ultra-thin, water-soluble sheets of concentrated soap that eliminate the need for bulky plastic containers. These soap strips are commonly packaged in minimal, recyclable, or biodegradable cardboard materials, substantially reducing packaging waste. This low-waste design supports Sustainable Development Goal (SDG) 12: Responsible Consumption and Production by promoting sustainable product design and waste reduction. Furthermore, the lightweight and compact nature of soap strips can lower transportation emissions, contributing to broader environmental sustainability efforts (Bufin, 2021).

Paper soap strips, or dissolvable hand soap sheets, are emerging as a sustainable alternative to conventional liquid and bar soaps due to their portability and minimal packaging. Studies show that these biodegradable strips provide effective hand hygiene while reducing plastic waste and resource use (Matsagar et al., 2025).
Betel leaf (Piper betle L.) is a traditional herbal crop in Southeast Asia, including the Philippines, valued for its glossy, heart-shaped leaves rich in antioxidants, antimicrobial compounds, and other bioactive constituents (Biswas et al., 2022; Panda & Panda, 2022). Its essential oils and phenolics make it suitable for natural health products, functional foods, and food preservation, increasing its value beyond traditional chewing practices (Singh & Guha, 2021). P. betle can be cultivated and processed on a small scale using simple methods such as drying, extraction, and packaging, allowing communities to produce value-added products, retain income locally, and promote sustainable livelihoods (Singh & Guha, 2021; Biswas et al., 2022).

Pansit-pansitan (Peperomia pellucida), locally known as ulasimang bato, is a common Philippine herb that thrives in moist, shaded areas, making it an accessible and low-cost resource for community-based projects. It has anti-inflammatory, antioxidant, and antimicrobial properties, supporting its use in herbal foods, extracts, and topical products (Khan et al., 2019). The plant can be easily harvested and processed with simple methods, allowing communities to participate in production, packaging, and small-scale entrepreneurship, which promotes skill development, retains economic benefits locally, and supports sustainable livelihoods.

College of Education thrust (Entrepreneurship and Community Development). Conventional hand soaps, particularly liquid soaps in single-use plastic bottles, contribute to environmental pollution through plastic waste and persistent synthetic surfactants. Biodegradable alternatives, such as dissolvable soap strips and paper soap sheets, offer sustainable hand hygiene solutions by minimizing packaging and using plant-based ingredients that break down more easily in the environment (Tesser et al., 2020). These eco-friendly formats help reduce soil and water pollution and align with circular economy principles, supporting responsible consumption and environmental protection in line with SDG targets (Tesser et al., 2020).

In line with the CRAFT framework, this study is primarily aligned with the “A” (Applied Technology and Knowledge Transfer) it applies scientific knowledge and sustainable practices in developing herbal soap strips from locally available plant-based ingredients. It also reflects “R” (Research and Reflective Professional Practice) through the use of research-based methods in evaluating the product’s effectiveness and acceptability. Furthermore, the study supports “T” (Transformative Collaboration and Lifelong Learning) by promoting sustainability awareness, practical skills, and community-based entrepreneurship through the production of eco-friendly hygiene products.

The research gap of this study, cosmetology and personal hygiene product development, innovation is vital to meet the growing demand for safe, effective, and environmentally sustainable products. While herbal liquid and bar soaps using plant-based ingredients have been widely studied, research on hand soap strip formulations incorporating indigenous medicinal plants such as shiny bush and betel leaf remains limited. Most commercial hand soaps still depend on synthetic antimicrobial agents and plastic packaging, raising concerns about skin sensitivity, environmental pollution, and sustainability. Although shiny bush and betel leaf are known for their antimicrobial and skin-protective properties, their combined use in dissolvable soap strips has not been sufficiently explored. However, this lack of research highlights the need to evaluate herbal soap strips as low-waste, cost-effective alternatives to conventional hand soaps that support sustainable development and community-based innovation (Farah, 2019).

Overall, this study seeks to develop a safe and effective herbal hand soap strip using shiny bush and betel leaf while simultaneously fostering innovation, practical skills, and entrepreneurial mindset among students and local communities. By transforming locally abundant plants into valuable products, the project bridges cosmetic science, sustainable development, and education, demonstrating the potential of community-centered, skill-based learning in promoting both health and economic resilience.

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Objectives of the Study

This study generally aimed to determine the acceptability of shiny bush-betel leaf hand soap strip. Specifically, it sought to:

1. determine the sensory qualities of the shiny bush-betel leaf hand soap strip in terms of appearance, ability to foam, scent and texture.
2. determine the general acceptability of shiny bush-betel leaf hand soap strip in terms of appearance, ability to foam, scent and texture,
3. determine the level of effectiveness of shiny bush-betel leaf hand soap strip among the three (3) treatments in terms of smoothing and moisturizing effect;
4. find out if there is a significant difference in the sensory qualities of shiny bush-betel leaf hand soap strip in terms of appearance, ability to foam, scent and texture;
5. find out if there is a significant difference in the general acceptability of shiny bush-betel leaf hand soap strip; and
6. find out if there is a significant difference in the level of effectiveness of shiny bush-betel leaf strip hand soap among the three (3) treatments in terms of smoothing and moisturizing effect;

Hypotheses of the Study

Based on the objective of this study, the hypotheses were formulated and to answer the unknown variables as follows:

1. There is no significant difference in the qualities of the product among the three (3) treatments in terms of color, ability to foam, scent and texture;
2. There is no significant difference in the general acceptability of shiny bush-betel leaf strip hand soap; and
3. There is no significant difference in the level of effectiveness of shiny bush-betel leaf strip hand soap in three three (3) treatments in terms of smoothing, moisturizing and soothing effect.

Scope and Limitations of the Study

The study focused on developing a hand soap strip formulation incorporating shiny bush and betel leaf extract as primary active ingredients. This study has three (3) treatments and used an experimental method. The factors used in evaluating the product were appearance, ability to foam, scent, texture, smoothing and moisturizing effect. The evaluation sheet was used with the Five (5) Point Likert scale as the research instrument in evaluating the product in terms of the acceptability of sensory qualities. To assess the product's treatments, there were twenty five (25) evaluators it consist of five (5) cosmetology instructors which has been considered as experts, five (5) beautician, five (5) teachers and ten (10) consumers. In addition, the evaluation did not include the assessment of potential allergen content or skin sensitivity reactions. The experimental formulation of the product was conducted at Capiz State University – Main Campus under the supervision of cosmetology professors. The study utilized three (3) treatments with varying proportions of the primary ingredients: Treatment A (25 ml shiny bush and 75 ml betel leaf), Treatment B (50 ml shiny bush and 50 ml betel leaf), and Treatment C (75 ml shiny bush and 25 ml betel leaf). The statistical tools used in analyzing the study were the arithmetic mean and the Kruskal–Wallis test. The arithmetic mean was utilized to determine the sensory qualities and effectiveness of the shiny bush–betel leaf hand soap strip, while the Kruskal–Wallis test was used to determine the significant differences among the three (3) treatments at a 0.05 level of significance.

The scope of the research did not encompass all possible variations in formulation (e.g., different extract concentrations or additional additives), which may restrict the generalizability of the findings to other potential formulations containing the same active extracts. Additionally, the study's results are specific to the chosen sample population and do not fully represent broader consumer preferences or efficacy across diverse demographics. Finally, the availability of resources and participants placed restrictions on the sample size and diversity, while strict adherence to ethical considerations regarding participant safety and informed consent naturally imposed certain constraints on the research procedures.

II. METHODOLOGY

This chapter presents and describes the research methodology, research design, tools and materials utilized in the study, ingredients, experimental procedure, assessment procedure, instrumentation, data collection procedure, and statistical tools and analysis performed.

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Method of Research

The experimental - developmental research approach was the technique employed in this investigation. The researcher carried out a comprehensive analysis of the body of research on the qualities, advantages, and uses of shiny bush-betel leaf as hand soap strip. To obtain knowledge on the subject, this entails looking through academic databases, scientific journals, books, and other pertinent sources. The plan was to carry out an experiment to assess the effectiveness of strip hand soap made of shiny bush-betel leaf. This entails systematically developing and testing multiple formulations of the strip hand soap. The goal is to compare the performance of different formulations against predetermined safety, stability, and cleaning criteria.

The developmental focused on the products are shiny bush- betel leaf, with three (3) treatments used with a varied amount of the aforesaid main ingredients. The experimental method focuses on the study in the future (what will be) when the variables or the study are carefully controlled or manipulated (Tabuena et al., 2021).

Observation and evaluation sheets, or questionnaires, were used to gather data from individuals about their experiences with using shiny bush-betel leaf hand soap strip. This method can provide insights into user perceptions, satisfaction levels, and the potential benefits or drawbacks of hand soap strip. The researcher observes and documents the effects of shiny bush and betel leaf as hand soap strip on participants in real-world settings. The researcher actively monitored and documented the effects of the shiny bush-betel leaf hand soap strip on individuals in natural settings. Lastly, the selected target participants evaluate the quality and stability of shiny bush and betel leaf as hand soap strip using standardized methods and quality control measures. This may include assessing factors such as formulation consistency and product safety.

Research Design

The research utilized a Completely Randomized Design (CRD) for the experimental setup, as described by Montgomery (2020). Evaluation samples were coded, and a score card was employed for randomization.

This approach enhanced the reliability of the comparisons made across the different formulations, particularly in assessing their sensory attributes such as color, ability to foam, scent and texture. The use of a randomized design enhanced the validity of the findings, and to assess consumer acceptability.

To investigate the potential benefits of the product formulation, the researcher made an outline, such as evaluating the moisturizing and smoothing effect of the product. The participants were assigned completely at random to different treatments so that each experimental unit had the same chance of receiving any one treatment. The experimentation was carried out in three (3) treatments, such as Treatments A, B, and C.

The defined eligibility criteria for participants, such as age, gender, skin type and others, were used to identify factors that would exclude individuals from participation.

The intervention being used was a developed, standardized formulation for the shiny bush-betel leaf hand soap strip, specific concentrations of active ingredients, and other components. To ensure the reliability and validity of the research findings, a standardized formulation was used, meaning the concentrations of the active ingredients and other components were precisely defined and consistent across all participants. This focus on consistency was extended to the user experience through a meticulously documented application protocol. This protocol specified the required frequency of use, the recommended duration of treatment, and detailed instructions for product application. Following the intervention period, the researcher systematically observed and recorded various outcome measures using a dedicated data observation sheet. These measures assessed the product's success, focusing on variables such as participant satisfaction and any observable effects, allowing for a structured analysis of the final results.

Experimental Procedure

Preparation of Shiny Bush Extract

To prepare the shiny bush extract, the researcher collected fresh samples from Brgy. Calitan, Panay, Capiz, which served as the raw materials for the study. The shiny bush were thoroughly washed under running water to remove dirt and impurities, then weighed, with ½ kilo of shiny bush used for extraction. The cleaned plant material was boiled in a casserole with 250 mL of water over medium-high heat for 20 minutes to obtain its active compounds. After boiling, the

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mixture was allowed to cool and then strained using a fine strainer to separate the liquid extract from the plant residues. The resulting shiny bush extract was measured and set aside for use in the formulation of the hand soap strips.

Preparation of Betel Leaf Extract

To prepare the betel leaf extract, the researcher collected fresh samples from Brgy. Ilaya, Ivisan, Capiz, which served as the raw materials for the study. The betel leaves were thoroughly washed with tap water to remove any dirt and impurities, then weighed, with ½ kilo used for extraction. The cleaned leaves were boiled in a casserole with a measured amount of water over medium-high heat for 20 minutes to extract their active compounds. After boiling, the mixture was allowed to cool and then strained using a fine strainer to separate the liquid extract from the solid residues. The resulting betel leaf extract was measured and set aside for use in the formulation of the hand soap strips.

Preparation of Shiny Bush-Betel Leaf as Hand Soap Strip

In preparing the shiny bush-betel leaf hand soap strip, the researcher began by gathering all the necessary materials and ingredients. Each ingredient was accurately measured using a digital scale and measuring cups to ensure consistency. The ingredients were then combined and gently heated over a low flame in a casserole until thoroughly mixed. Baking paper was carefully dipped into the mixture, and this process was repeated three (3) to four (4) times to achieve the desired thickness of the soap strips. The strips were then hung to dry, and after approximately one (1) hour, they were carefully removed from the mold. The finished product was left to set for one week before packaging and labeling.

Evaluation Procedure

The evaluation of shiny bush-betel leaf hand soap strip was done with 25 evaluators, who were divided into the following: ten (10) cosmetology teachers, five (5) beauticians, and ten (10) consumers. The evaluation was made using an evaluation sheet established with a Five (5) Point Likert scale for the sensory qualities' evaluation of the shiny bush-betel leaf hand soap strip , its acceptability, and its effectiveness.

This was done to determine the level of acceptability of the shiny bush-betel leaf hand soap strip in terms of appearance, ability to foam, scent and texture, and to find out the level of effectiveness in terms of smoothing, moisturizing and soothing. The evaluation was done at Capiz State University, Roxas City Main Campus, by teachers, students, and beauticians within Roxas City and the Province of Capiz.

Instrumentation

The research instrument used was an evaluation sheet prepared by the researcher to evaluate the utilization of shiny bush-betel leaf hand soap strip with a Five (5) Point Likert scale for the sensory qualities, acceptability, and effectiveness of the product. The content was subjected to content validation by the committee members and experts.

Data Gathering Procedure

Prior to conducting the data gathering, the researcher carried out necessary preparatory activities. This included identifying and securing the participation of the evaluators, as well as sending formal letter of request to seek permission from the concerned panels and respondents. The purpose of the study was explained, and informed consent was obtained to ensure ethical compliance.

For Treatments A, B, and C, shiny bush-betel leaf hand soap strip was evaluated by twenty five (25) experts in three replications to test the sensory qualities with a five (5) point Likert scale for variables such as the acceptability of the product in terms of appearance, ability to foam, scent and texture and the effectiveness of the product in terms of smoothing and moisturizing effect when applied to the hands. To have a better understanding of the result, the researcher also gave the equivalent interpretation for each scale that corresponds to a five (5) point Likert scale in determining the level of acceptability of the product.

Statistical Analysis

The Statistical Package for Social Sciences, or SPSS, was used to analyze and interpret the data gathered in the study. The arithmetic mean were used to determine the level of sensory qualities, acceptability, and effectiveness of the hand soap strip based on the evaluators' responses. To determine the significant differences among the three (3) treatments (A, B, and C), the Kruskal–Wallis test was employed at a 0.05 level of significance. This statistical tool was used to assess differences in appearance, ability to foam, scent, texture, acceptability, smoothing effect, and moisturizing effect,

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since the data were based on ordinal responses using a Likert scale. When significant differences were found, post hoc analysis was conducted to identify which specific treatments differed from one another (Field, 2018).

III. RESULT AND DISCUSSION

The study evaluated the sensory qualities, acceptability, and effectiveness of the shiny bush-betel leaf hand soap strip using three different treatments with varying proportions of shiny bush and betel leaf extracts. Results revealed that all treatments were positively accepted by the respondents; however, Treatment C consistently obtained the highest mean scores across most evaluated attributes.

In terms of sensory qualities, Treatment C was rated highest in appearance, scent, and texture, while Treatment B obtained the highest score in foaming ability. The findings indicate that increasing the concentration of shiny bush extract improved the visual appeal, smoothness, and overall sensory performance of the hand soap strip while maintaining acceptable foaming properties. These results suggest that formulation ratio plays an important role in determining product quality and consumer preference.

For general acceptability, Treatment C was identified as the most preferred formulation, followed by Treatments B and A. Respondents found Treatment C more attractive, pleasant, and user-friendly compared to the other treatments. The findings imply that optimizing the proportion of plant-based extracts can significantly enhance consumer acceptance of natural hygiene products.

In terms of effectiveness, all treatments were evaluated as effective in providing smoothing and moisturizing effects. Treatment C received the highest ratings, particularly for moisturizing effect, indicating that higher concentrations of shiny bush extract contribute to better skin hydration and conditioning. Nevertheless, statistical analysis showed no significant differences among treatments in smoothing effect, moisturizing effect, and overall effectiveness, suggesting that all formulations were capable of delivering acceptable skin-care benefits.

The statistical tests further revealed significant differences among treatments in appearance, foaming ability, texture, and general acceptability, confirming that formulation variations directly affected these sensory attributes. However, no significant difference was observed in scent, smoothing effect, and moisturizing effect, indicating that the natural properties of shiny bush and betel leaf extracts provided relatively consistent performance across treatments.

Overall, the findings demonstrate that Treatment C is the most effective and acceptable formulation among the three treatments. The study highlights the potential of shiny bush and betel leaf as sustainable botanical ingredients for developing natural, portable, and consumer-friendly hand soap strips. Furthermore, the results emphasize the importance of formulation balance in improving both sensory and functional qualities of plant-based hygiene products.

IV. CONCLUSION

From the findings of the study, the following conclusions were drawn:
The concentration of shiny bush and betel leaf extract is a key determinant of the sensory quality of the hand soap strip. As the extract concentration increases from Treatment A to Treatment C, sensory ratings consistently improve across appearance, foaming ability, and texture, establishing that ingredient proportion directly governs the physical and functional characteristics of the formulation.

A hand soap strip formulated with shiny bush and betel leaf extract is a feasible and acceptable natural alternative for hand hygiene. Treatment C, having the highest extract concentration, proved to be the most optimal formulation, meeting the sensory and functional standards expected of a commercially viable hand soap strip product.

Both shiny bush and betel leaf extracts possess inherent properties that support skin smoothing and moisturizing, regardless of concentration level. The uniform acceptability of all three treatments in terms of effectiveness confirms that these natural ingredients are intrinsically capable of delivering skin conditioning benefits, making them reliable active components in hand care formulations.

The absence of significant differences in scent across all treatments indicates that the aromatic profile of shiny bush and betel leaf extracts remains relatively constant regardless of concentration. This implies that achieving distinct or enhanced fragrance in the product requires supplementary scent-enhancing ingredients, as adjusting extract concentration alone is insufficient to produce perceptible scent variation. In contrast, the significant differences observed in appearance,

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foaming ability, and texture confirm that Treatment C's superior physical performance is attributable to its higher extract concentration, underscoring the critical role of formulation optimization in achieving desired product quality.

The broad acceptance of Treatment C across diverse evaluator groups — students, teachers, beauticians, and consumers — demonstrates that higher concentrations of shiny bush and betel leaf extract produce a hand soap strip that meets the expectations of varied end-users. This cross-group acceptance affirms the formulation's practical suitability for general use, not merely within a specific demographic.

Overall, the study concludes that shiny bush and betel leaf are potent, sustainable botanical ingredients capable of producing an effective and consumer-acceptable hand soap strip. The superiority of Treatment C across sensory and effectiveness criteria validates the principle that higher natural extract concentrations yield better-performing formulations. These findings contribute meaningful evidence to the growing body of research supporting plant-based alternatives in personal care product development, particularly in the hand care industry.

V. RECOMMENDATION

The following are the recommendations based on the findings and conclusions of the study:
It is recommended to experiment with slight adjustments to the ingredients or their proportions in each treatment to optimize their benefits. For example, the ratio of shiny bush and betel leaf extract can be adjusted in Treatment A to further enhance its moisturizing effect. For other treatments, experimenting with different extraction methods of shiny bush and betel leaves and additives for scent and strip hand soap formulation. Each method may result in different concentrations of active ingredients and sensory qualities.

Providing sampling programs or trial-sized versions of the different treatments is encouraged to allow consumers to directly experience the smoothing and moisturizing benefits. This approach may be implemented in accordance with ethical standards by ensuring that the product is accompanied by clear and complete usage instructions, including proper application, recommended frequency, and necessary precautions or warnings. Such guidance can improve user experience and help maximize the effectiveness of the hand soap strip.

Continuous collection of feedback from consumers using Treatment C is encouraged to better understand their satisfaction levels and identify areas for improvement. The insights gathered may be used to refine the product or guide future product development. In addition, sustainability should be considered in the selection of ingredients and packaging materials by prioritizing locally sourced, organic components and utilizing eco-friendly packaging options to minimize environmental impact.

It is suggested to consider adding or changing ingredients to make a different combination to enhance the effectiveness of hand soap strip. It is also recommended to make use of a timer during the testing of the hand soap strip to ensure a more accurate and unbiased result.

Finally, it is recommended that future evaluations include the assessment of potential allergen content and skin sensitivity reactions, as this was not covered in the present study. Incorporating allergen testing will help ensure product safety, particularly for individuals with sensitive skin, and will further strengthen the reliability and applicability of the findings.

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