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# Ideal Sensory Profile Identification of Fermented Drinks Based on Pineapple Peel (*Ananas comosus L.*)

## *Identifikasi Profil Sensori Ideal Minuman Fermentasi Kulit Buah Nanas (Ananas comosus L.)*

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**ABSTRACT**

**Background:** The inedible parts of pineapple account for 40% of its weight, including the peel, which can be utilized through fermentation into a beverage known as tepache. This probiotic drink holds significant potential for industrial development in Indonesia. However, there is limited information regarding the sensory profiles and consumer preferences specific to the Indonesian market.
**Objectives:** This study aimed to analyze the ideal sensory profile of fermented beverages made from pineapple peel.
**Methods:** This experimental study consisted of three stages: product formulation, sensory evaluation using the ideal profile method, and sensory evaluation using Quantitative Descriptive Analysis (QDA). A completely randomized design (CRD) with a single-factor approach was used, involving three treatments: sample A (500 g pineapple peel and 500 g palm sugar), sample B (500 g pineapple peel and 600 g palm sugar), and sample C (500 g pineapple peel and 700 g palm sugar). Each treatment was replicated twice. Data on sensory profiles were processed using Microsoft Excel.
**Results:** The sensory profile of product code A most closely resembled the ideal profile, particularly with the peely attribute. The attributes requiring a decrease in intensity for product code A were rich, citric, bitter, astringent, and acidic. Conversely, the attributes needing an increase were light, sparkle, sweet, and fresh
**Conclusions:** Consumer perceptions indicate that the product with sensory characteristics closest to the ideal profile is product code A.

## INTRODUCTION

Fermented beverages have long been recognized as products that are not only refreshing but also provide various health benefits. One of the potential materials for developing fermented beverages is pineapple peel. Pineapple peel, often considered waste, contains various bioactive compounds such as vitamin C, bromelain enzymes, and other antioxidant compounds[1]. The utilization of pineapple fruit is generally limited to its flesh, which is used in products such as juice, jam, salad, and syrup. Pineapple peel is typically discarded or used as animal feed. However, pineapple peel is rich in nutrients, including carbohydrates (17.53%), water (81.72%), crude fiber (20.87%), protein (4.41%), reducing sugar (13.65%), and various other vitamins and minerals[1]. The high carbohydrate and sugar content present significant potential for further processing into valuable products such as ethanol or other fermented food products[2].

According to research, pineapple fruit, cores, and peels possess traditional medicinal properties. These components contain active substances such as flavonoids, bromelain enzymes, vitamin C, and anthocyanins, which have antibacterial benefits. Additionally, pineapple peel contains chemical compounds beneficial for health, such as bromelain, flavonoids, tannins, oxalates, and phytates, with bromelain and dihydroflavonone flavonoids being the major components. These compounds exhibit stronger antibacterial activity against Gram-positive bacteria. The utilization of pineapple peel through fermentation not only reduces waste but also produces a nutrient-rich beverage with a distinctive flavor.

*Tepache* is one of the fermented beverage products that can be made using pineapple peel extract. The potential of pineapple peel as a raw material for *tepache* production lies in its carbohydrate and sugar content, which enhances its value. *Tepache*, a traditional fermented beverage originating from Mexico, is typically made from pineapples and oranges. During the fermentation process, bacteria and yeast convert carbohydrates in pineapple peel into acids, gases, and alcohol, giving *tepache* its unique and slightly alcoholic



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taste[3]. In recent years, fermented beverages like *tepache* have gained popularity as functional drinks that support gut health through their probiotic content. Fermentation not only extends the shelf life of beverages but also creates unique flavors and aromas that play a key role in consumer acceptance[4].

The urgency of this research lies in utilizing pineapple peel as the primary ingredient for *tepache* production, which is an effective approach to reducing agricultural waste while enhancing the diversification of functional beverage products. This dual benefit—environmental sustainability and health improvement—makes the endeavor highly significant. Studies show that using pineapple peel for fermentation can result in beverages with high nutritional value and sensory characteristics appealing to consumers[5]. Furthermore, research on *tepache* has demonstrated that variations in additional ingredients, types of fruits, and fermentative microorganisms can influence the sensory characteristics and final quality of the beverage. Innovations in *tepache* production include using different types of fruits and supplements to enhance flavor and health benefits[4]. Additionally, various studies explore the effects of different fermentation treatments on *tepache*'s sensory profile to create products more aligned with consumer preferences.

Sensory profiling is a crucial aspect of developing and evaluating fermented beverage products such as *tepache*. The seriousness in product development focuses on sensory quality, encompassing evaluations of attributes like taste, aroma, color, and texture, which influence the consumer experience. A comprehensive understanding of the sensory profile helps producers develop products that meet consumer preferences and desired quality standards[6]. Therefore, identifying the ideal sensory profile of fermented pineapple peel beverages is essential to produce products that meet consumer expectations and quality standards. Additionally, the sensory profile is vital because fermented beverages like *tepache* can vary significantly in sensory characteristics depending on the raw materials and fermentation process used. For instance, variations in pineapple peel proportions, types of sugars, and fermentation time and conditions can result in different sensory profiles. Thus, understanding and controlling these factors are critical for achieving product consistency and consumer satisfaction[6]. An ideal sensory profile is crucial to ensure consumer acceptance and market success. This research explores significant sensory attributes as a key to create a competitive and widely accepted product.

Previous studies have shown that sensory profiling is a key factor in determining consumer acceptance of fermented products[7]. By understanding dominant sensory attributes and consumer preferences, producers can modify production processes and formulations to achieve desired product quality. Additionally, related studies indicate that a deep understanding of sensory profiling can enhance the acceptance of fermented products and assist in the development of improved products[8]. The potential of pineapple peel-based fermented products in the healthy beverage industry is substantial, in line with the growing popularity of fermented drinks like kombucha and kefir. These products enrich options for consumers seeking alternative tropical fruit-based beverages with unique flavors and potential health benefits.

This research aimed to identify the ideal sensory profile of fermented pineapple peel beverages through a systematic sensory evaluation approach. This involves analyzing various sensory attributes to determine the most desirable combination for consumers. The results of this study will serve as a guide for developing pineapple peel-based fermented beverages with sensory qualities favored by the market or consumers and possessing competitive value.

## METHODS

This study was conducted from April to August 2024 in the Laboratory of the Nutrition Study Program, Universitas Negeri Medan. It employed an experimental design comprising three stages: formulation determination, product development, and sensory evaluation using the Quantitative Descriptive Analysis (QDA) method. The experimental design used was a Randomized Block Design (RBD) with a non-factorial arrangement, featuring three treatment levels, each repeated twice. The product formulation composition is shown in Table 1. The formulation used was a modification of a previous study[9]. The pineapple peels used in this study were sourced from pineapples (*Ananas comosus* L.) obtained from Sipahutar village, and the palm sugar (*Arenga saccharifera*) was procured from farmers in Kinangkung Sibolangit village, North Sumatra. The fermentation process lasted for 48 hours at ambient temperature (approximately 33–37°C).

**Table 1.** Product formulation

| No | Ingredients | Unit | Treatment | | |
|---|---|---|---|---|---|
| | | | A | B | C |
| 1 | Pineapple peel | gr | 500 | 500 | 500 |
| 2 | Palm sugar | gr | 500 | 600 | 700 |
| 4 | Water | L | 1.5 | 1.5 | 1.5 |
| 5 | Cinnamon stick | cm | 10 | 10 | 10 |



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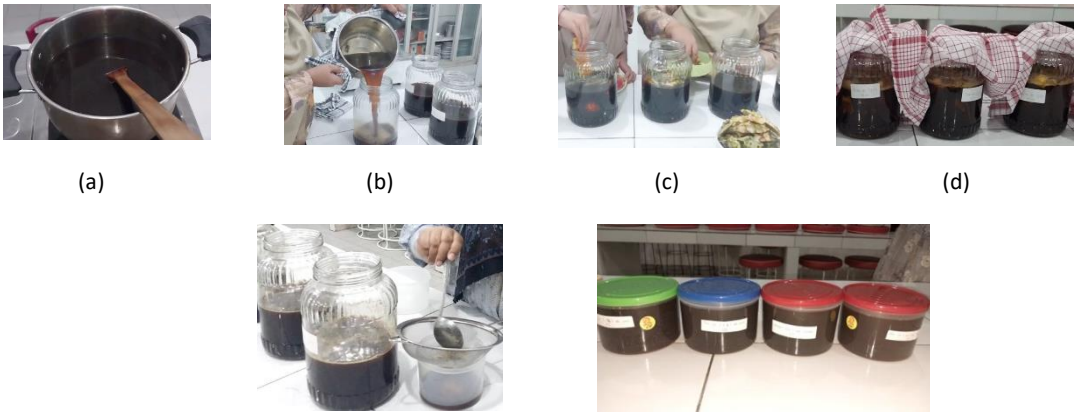
**Images 1**. Equipment, materials, and fermented pineapple peel beverage (*Tepache*) for each formula

**Product Preparation Procedure**

*Tepache* is a fermented beverage made from pineapple peel and palm sugar. The materials and tools required for its preparation are readily available (Figure 1). The pineapple peel used in this study came from the local *Sipahutar* pineapple variety, known for its sweetness. The peel was separated from the fruit pulp, cleaned thoroughly to remove dirt, and prepared for further use. The treatment formulations focused on the composition of palm sugar, as Najini et al. (2024) highlighted the impact of palm sugar on nutrients required by lactic acid bacteria (LAB) during fermentation[10]. The *tepache* preparation procedure is as follows:



(a) (b) (c) (d) (e) (f)

(a) Boiling water and palm sugar (b) Pouring the palm sugar solution into a container (c) Mixing pineapple peel and cinnamon sticks into the palm sugar solution (d) Fermenting the mixture for 48 hours (e) Straining the beverage (f) Storing the beverage in a sealed container at 5–10°C.

**Images 2**. Flowchart of product preparation

**Sensory Analysis of Ideal Profile Using QDA**

The ideal sensory profile of *tepache* was evaluated using the QDA method. The panelists consisted of 50 students from the Nutrition Study Program, Universitas Negeri Medan. Prospective panelists first completed an informed consent form to indicate their willingness to participate in the study. Ethical approval for human subject involvement in this study was obtained from the Maranatha Christian University Health Research Ethics Committee (28 August 2024) with approval number: 132/KEP/VIII/2024. The inclusion criteria for panelists were familiarity with and prior consumption of *tepache* and previous participation as sensory panelists for this beverage. Panelists who had no prior knowledge of or had never consumed *tepache* were excluded. The organoleptic assessment form used was a modification of a previous study[11]. The panelists were provided with the organoleptic evaluation form and instructions on how to assess the product based on sensory attributes, as shown in Table 2. Explanations were given by the researchers before panelists began their evaluations. Panelists rated the provided sensory attributes, which were adapted from Nurlela (2023).



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**Table 2.** Sensory attributes of pineapple peel fermented beverage (*Tepache*)

| Attribute | Description |
|---|---|
| Sweetness | Flavor associated with the basic taste of palm sugar |
| Peelability | Flavor associated with the taste of pineapple peel. |
| Sourness | Flavor associated with acidic taste. |
| Effervescence/Fizziness | Flavor associated with soda-like effects. |
| *Freshness* | Aroma associated with freshness. |
| Citrusy | Aroma associated with pineapple. |
| Bitterness | Aftertaste leaving a bitter sensation. |
| Lightness | Sensation of lightness when consumed. |
| Richness | Impression of thickness or fullness. |
| Astringency | Aftertaste leaving a tangy sensation |

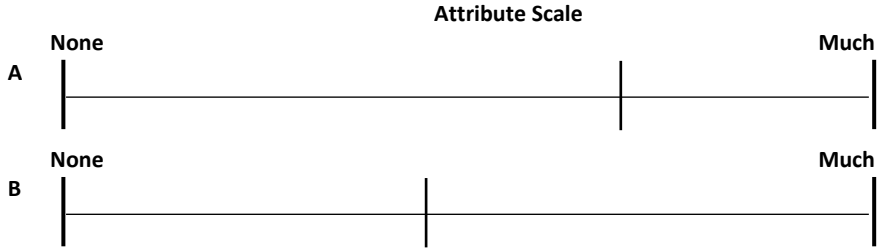
Source: Modified from Nurlela (2023)

Sensory evaluation was conducted in a room maintained at 25°C (room temperature). Samples were served in 50 mL plastic cups, coded with random three-digit numbers (Table 3) to minimize and reduce error stimuli[11]. The ideal profile data were obtained by having panelists evaluate each sensory attribute of the product samples one at a time. Each panelist was given a set of samples, 20 mL per sample, and a glass of mineral water as a palate cleanser to neutralize aftertaste. Before the test, panelists were briefed on how to assess each attribute using a descriptive scaling method, as illustrated in Figure 1. Panelists were instructed to taste the sample and mark the perceived intensity (real) and the ideal intensity for each sensory attribute on an unstructured 100-mm horizontal scale without comparing samples. Each attribute evaluation was conducted in duplicate to ensure the stability of panelist assessments. Data analysis was performed using Microsoft Excel 2019.

**Table 3.** Sample codes for pineapple peel fermented beverage (*Tepache*)

| No | Formulation | Sample Code | Description |
|---|---|---|---|
| 1 | A | 746 | 500 g pineapple peel + 500 g palm sugar |
| 2 | B | 768 | 500 g pineapple peel + 600 g palm sugar |
| 3 | C | 780 | 500 g pineapple peel + 700 g palm sugar |

**Sample Codes**




**Images 3**. Example of attribute evaluation using a line scale (A: real product evaluation, B: ideal product evaluation)

## RESULTS AND DISCUSSIONS

Ideal profile mapping was conducted on the pineapple peel fermented beverage samples using sensory attributes as listed in Table 2. This mapping can be utilized to improve product quality based on consumer perception. The ideal profile mapping revealed that each sample exhibited varying evaluation patterns across the attributes, indicating distinct sensory characteristics. The results of the ideal profile mapping analysis for pineapple peel fermented beverage (*tepache*) are shown in Figure 4.

The sweetness attribute indicates that samples B and C approached the ideal value (6 and 7), with sample C being the closest. Sample A fell below the ideal standard, indicating a lower sweetness level than desired. Sweetness is a critical attribute in many food products, particularly beverages and fruits, as it strongly influences consumer preference. Sweetness is one of the most favored tastes, especially in products targeting a broad market. Research by Abdurrahman and Suryani (2023) demonstrated that sugar concentration significantly impacts consumer preference for *tepache* beverages[4]. Similarly, a study by Sagita (2023) emphasized that a balanced taste between the acidity from pineapple peel and the sweetness from sugar enhances panelist preference[1].

For the acidity attribute, sample A was closer to the ideal value than the other samples. Acidity is an essential component in refreshing products such as fruit juices or carbonated beverages. The appropriate level of acidity provides freshness and helps balance sweetness. A balance between sweetness and acidity is crucial for evaluating fruit-based and soft drink products. Acidity in *tepache* is influenced by the reduction in pH levels, which



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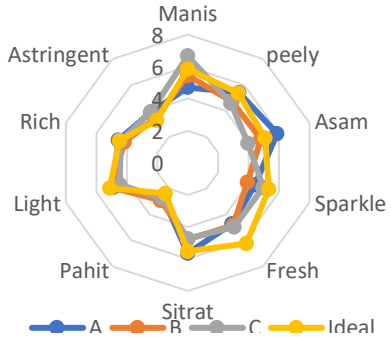
corresponds to an increase in lactic acid concentration. This acidity is also affected by flavor compounds formed by cultures, starters, or enzymes present in the fermented beverage. Hedonic testing showed that panelists favored the taste of probiotic beverages made from pineapple peel, characterized by a strong acidic taste[10]. Research also reported that adding pineapple peel powder to probiotic beverages reduces pH due to acid production by microorganisms during fermentation[12]. Furthermore, pineapple waste is rich in fiber, which serves as a prebiotic, supporting the growth of beneficial microorganisms and increasing acid production during fermentation. Consequently, the fiber content in pineapple peel contributes not only to digestive health but also to the sensory characteristics of the resulting beverage[13].




**Images 4**. Ideal profile mapping of pineapple peel fermented beverage (*Tepache*)

For the sparkle attribute, all samples showed significant differences from the ideal standard. Sparkle may refer to the sensation of carbonation or freshness in the mouth. Sample C was closest to the ideal value, whereas samples A and B were much lower. Carbonation in beverages, including *tepache*, is produced through fermentation, where microorganisms generate carbon dioxide ($CO_2$). Research by Leksrisompong et al. (2013) indicated that carbonation is closely linked to consumer preference for carbonated beverages[14]. Optimal carbonation levels enhance freshness and sensory appeal in *tepache*. Additionally, a study by Wise et al. (2013) revealed that the presence of bubbles in carbonated beverages influences consumers' perception of carbonation, contributing to the overall drinking experience. Sample C's proximity to the ideal value suggests that the formulation or fermentation process for this sample may be more effective in producing the desired carbonation[15]. This aligns with findings by Rebouças et al. (2014), which indicated that optimizing fermentation processes affects the sensory properties of beverages, including carbonation and freshness[16].

For the freshness attribute, sample C was closer to the ideal standard, indicating that this sample delivered a higher impression of freshness than the others. Freshness is a highly important sensory attribute in beverage evaluation, especially for fruit-based products, as it impacts the overall consumer experience[6]. Pineapple peel fermentation can produce various volatile compounds that enhance fresh aromas and sensory experiences. Sample C's higher freshness may result from a better formulation that optimizes the production of aromatic compounds.

Samples A and B exhibited higher bitterness levels compared to sample C and the ideal standard. Excessive bitterness in food products, particularly beverages, can reduce consumer appeal, except for certain products like coffee or tea. Bitterness is a sensory attribute that significantly influences overall product perception, and excessive bitterness in beverages is often considered undesirable[12]. Bitterness in fermented beverages may originate from several sources, including phenolic compounds produced during fermentation[17]. The addition of raw materials such as sugar can increase phenolic content in beverages, contributing to bitterness. In this case, the pineapple peel or palm sugar used in *tepache* might contain phenolic compounds that contributed to the bitterness detected in samples A and B.

On the light and rich attributes, sample B exhibited a better balance between the two, approaching the ideal standard. These attributes reflect whether a product feels light or rich in the mouth and are essential in various food and beverage categories. A balance between light and rich attributes can influence the sensory experience and overall product acceptance by consumers. The light attribute in beverages often relates to freshness and a sense of lightness, providing a refreshing impression upon consumption. This characteristic tends to be favored by consumers. Conversely, the rich attribute is associated with depth of flavor and complexity experienced in the mouth. Richness is often linked to higher concentrations of aroma and flavor compounds, enhancing the sensory experience. In the context of *tepache*, the richness attribute may result from phenolic compounds and organic acids produced during fermentation, which contribute to the desired flavor depth[17].

Astringency, or dryness, is a mouthfeel sensation often caused by compounds such as tannins and organic acids that bind proteins in the mouth, creating a dry and astringent sensation[18]. The astringent attribute displayed diverse results among the samples. Samples A and B were closer to the ideal value than sample C, which deviated significantly from the standard. Astringency is typically undesirable in most products, except for tea or specific products where this characteristic is sought after. Astringency in fermented beverages can be influenced by factors such as raw material composition and fermentation processes. Research indicates that acetic



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acid produced during fermentation can lead to undesirable astringent sensations in beverages[19]. Pineapple peels used in *tepache* may contain compounds that contribute to astringency. Samples A and B, which showed better levels of astringency, may have been achieved through improved formulations.

The peely attribute, which seems to describe the texture or sensation associated with pineapple peel, showed minor variations among the samples, with sample A being closest to the ideal. This attribute is particularly relevant in fruit-based products, where the peel or fiber texture can influence the sensory experience. A favorable peely sensation can enhance product quality perception and consumer satisfaction[20]. The fiber content in pineapple peels contributes to the desired peely sensation, enriching the sensory experience of consuming the beverage. Sample A, which approached the ideal value, may have been achieved through a more optimized formulation. Overall, these findings highlight that the peely attribute in *tepache* is essential for creating a beverage that is not only refreshing but also offers an appealing texture. Leveraging the potential of pineapple peel as a raw material and optimizing the fermentation process can make *tepache* a healthy beverage alternative with high sensory appeal. Striking a balance between the peely attribute and flavor will be key to capturing consumer interest and increasing market acceptance.

Based on the analysis of the attributes, it is clear that consumer preference for a product is significantly influenced by a balance of sweetness, acidity, sparkle, and freshness—key sensory attributes. According to Prescott (2013), consumer preference tends to be higher for products that achieve a balance of sweetness and acidity while delivering a refreshing and light impression[21]. The optimization guidelines for each product code are illustrated in Figure 5. In the graph, a value of 0 represents the ideal intensity. A positive scale (+) indicates excessive intensity of an attribute that needs to be reduced, while a negative scale (-) signifies insufficient intensity that requires enhancement. The required adjustments to attribute intensity are categorized into three levels based on the average highest and lowest values for ease of identification: slight (scale 0 to ±1.3), moderate (scale ±1.4 to ±2.6), and substantial (scale ±2.7 to ±4)[22].

The optimization conclusions for the adequacy profile of each product code are presented in Table 3. Among the samples, product code A required the fewest adjustments to bring the attribute intensities closer to the ideal. Attributes requiring a reduction in intensity for code A, in order, are rich, citric, bitter, astringent, and acidic. Meanwhile, attributes needing increased intensity are light, sparkle, sweetness, and freshness. These findings suggest that the development of pineapple peel fermented beverages based on consumer perception as a product with characteristics closest to the ideal profile is best represented by product code A. A summary of the suggested increases and decreases in attribute intensity for each product is provided in Table 3. The ideal profile for *tepache* beverages derived from this study can serve as an initial reference for fermented beverage entrepreneurs to develop products aligned with consumer expectations. However, the consumer panelists involved in this study were limited to nutrition students from Universitas Negeri Medan. Thus, future studies should incorporate a broader range of consumer panelists to obtain a more detailed understanding of the ideal product characteristics.




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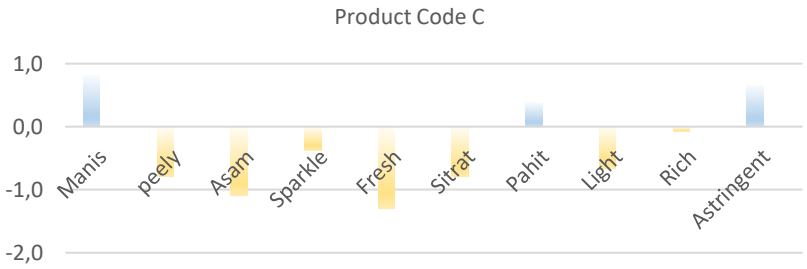


**Figure 5.** Adequacy profile of sensory attributes for pineapple peel fermented beverages in comparison to ideal intensity for product codes A, B, and C.

**Table 3.** Summary of attribute intensity adjustments for each product

| Attribute | Product Code | | |
|---|---|---|---|
| | A | B | C |
| Sweetness | Increase significantly | Increase slightly | Decrease significantly |
| Peelability | Ideal | Increase significantly | Increase significantly |
| Sourness | Decrease significantly | Increase slightly | Increase significantly |
| Effervescence/Fizziness | Increase significantly | Increase significantly | Increase slightly |
| *Freshness* | Increase significantly | Increase significantly | Increase significantly |
| Citrusy | Decrease slightly | Increase significantly | Increase significantly |
| Bitterness | Decrease slightly | Decrease significantly | Decrease slightly |
| Lightness | Increase slightly | Increase slightly | Increase significantly |
| Richness | Decrease slightly | Increase significantly | Increase slightly |
| Astringency | Decrease significantly | Decrease slightly | Decrease significantly |

## CONCLUSIONS

Overall, consumer perceptions indicate that the product with sensory profile characteristics closest to the ideal is product code A, where the peely attribute aligns with consumer perceptions of an ideal product. However, there is still room for improvement in other attributes. Improvements can be made by involving a broader range of consumer panelists (not limited to nutrition students from Universitas Negeri Medan) to obtain more diverse data.

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## AUTHOR CONTRIBUTIONS

CP: Conceptualization, investigation, methodology, supervision, writing–review and editing, formal analysis. IAS: Writing–original draft, formal analysis. LRN: Writing–original draft, formal analysis, resources.

## REFERENCES

1. Sagita, C. Pembuatan minuman probiotik dari limbah kulit nanas (*Tepache*). *Tarbiatuna: Journal of Islamic Education Studies* **3**, 205–210 (2023). https://doi.org/10.47467/tarbiatuna.v3i2.3017.
2. Liangkun, L. *et al.* Evaluation of antioxidant capacity and flavor profile change of pineapple peel vinegar during fermentation. in *3rd Int Conf on MSMEE* 380–387 (2018).
3. Pinto, T., Vilela, A. & Cosme, F. Chemical and sensory characteristics of fruit juice and fruit fermented beverages and their consumer acceptance. *Beverages* **8**, 33 (2022). https://doi.org/10.3390/beverages8020033.
4. Abdurrahman, F. H. R. & Suryani, T. Antioxidant activity and organoleptic quality of probiotic *tepache* of pineapple peel sugar variation and fermentation duration. in *Proceeding of International Conference on Biology Education, Natural Science, and Technology* vol. 1 502–508 (2023).



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5. Sabino, L. L., de Oliveira Silva, M. F. & de Castilhos, M. B. M. Production of fermented beverage using pineapple residue as an alcoholic fermentation substrate: a physicochemical and sensory approach. *European Food Research and Technology* **249**, 387–396 (2023). https://doi.org/10.1007/s00217-022-04124-6.
6. Yamahata, N., Toyotake, Y., Kunieda, S. & Wakayama, M. Application of multiple sensory evaluations to produce fermented beverages made from sole whey using Kluyveromyces marxianus. *Int J Food Sci Technol* **55**, 1698–1704 (2020). https://doi.org/10.1111/ijfs.14440.
7. Hinojosa-Avila, C. R., García-Gamboa, R., Chedraui-Urrea, J. J. T. & García-Cayuela, T. Exploring the potential of probiotic-en*riche*d beer: Microorganisms, fermentation strategies, sensory attributes, and health implications. *Food Research International* **175**, 113717 (2024). https://doi.org/10.1016/j.foodres.2023.113717.
8. Pinto, T., Vilela, A. & Cosme, F. Chemical and Sensory Characteristics of Fruit Juice and Fruit Fermented Beverages and Their Consumer Acceptance. *Beverages* **8**, 33 (2022). https://doi.org/10.3390/beverages8020033.
9. Hujjatusnaini, N. *et al.* Inovasi minuman *tepache* berbahan baku kulit nanas (Ananas comosus (L.) Merr.) tersuplementasi probiotik Lactobacillus casei. *Jurnal Teknologi Pangan dan Gizi (Journal of Food Technology and Nutrition)* **21**, 47–54 (2022). DOI:10.33508/jtpg.v21i1.3568.
10. Najini, R. *et al.* Minuman Probiotik *Tepache* dari Fermentasi Kulit Buah Nanas (Ananas Comosus L.) Menggunakan Variasi Jenis dan Konsentrasi Gula. *Journal Pharmacy of Tanjungpura* **1**,74-79 (2024).
11. Galler, M., Næs, T., L. Almli, V. & Varela, P. How children approach a CATA test influences the outcome. Insights on ticking styles from two case studies with 6–9-yearold children. *Food Qual Prefer* **86**, 104009 (2020). DOI: 10.1016/j.foodqual.2020.104009.
12. da Fontoura Prates, D. *et al.* Development, fermentation, and storage of kefir with extract of pineapple residues and *Spirulina* sp. *J Food Process Preserv* **46**, (2022). https://doi.org/10.1111/jfpp.17078.
13. Diaz-Vela, J., Totosaus, A., Cruz-Guerrero, A. E. & de Lourdes Pérez-Chabela, M. *In vitro* evaluation of the fermentation of added-value agroindustrial by-products: cactus pear (*Opuntia ficus-indica*) peel and pineapple (*Ananas comosus*) peel as functional ingredients. *Int J Food Sci Technol* **48**, 1460–1467 (2013). https://doi.org/10.1111/ijfs.12113.
14. Leksrisompong, P. P., Lopetcharat, K., Guthrie, B. & Drake, M. A. Preference Mapping of Lemon Lime Carbonated Beverages with Regular and Diet Beverage Consumers. *J Food Sci* **78**, (2013). https://doi.org/10.1111/1750-3841.12028.
15. Wise, P. M., Wolf, M., Thom, S. R. & Bryant, B. The Influence of Bubbles on the Perception Carbonation Bite. *PLoS One* **8**, e71488 (2013). https://doi.org/10.1371/journal.pone.0071488.
16. Rebouças, M. C., Rodrigues, M. do C. P. & Afonso, M. R. A. Optimization of the Acceptance of Prebiotic Beverage Made from Cashew Nut Kernels and Passion Fruit Juice. *J Food Sci* **79**, (2014). https://doi.org/10.1111/1750-3841.12507.
17. Byresh, T. S. *et al.* Effect of addition of pineapple peel powder on white finger millet vegan probiotic beverage. *J Food Process Preserv* **46**, (2022). https://doi.org/10.1111/jfpp.16905.
18. Maselesele, T. L., Molelekoa, T. B. J., Gbashi, S. & Adebo, O. A. The Optimisation of Bitter Gourd-Grape Beverage Fermentation Using a Consolidated Response Surface Methodology (RSM) and Artificial Neural Network (ANN) Approach. *Plants* **12**, 3473 (2023). https://doi.org/10.3390/plants12193473.
19. Wang, S. *et al.* Effect of synthetic microbial community on nutraceutical and sensory qualities



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of kombucha. *Int J Food Sci Technol* **55**, 3327–3333 (2020). https://doi.org/10.1111/ijfs.14596.

20. Postigo, V., Sanz, P., García, M. & Arroyo, T. Impact of Non-Saccharomyces Wine Yeast Strains on Improving Healthy Characteristics and the Sensory Profile of Beer in Sequential Fermentation. *Foods* **11**, 2029 (2022). https://doi.org/10.3390/foods11142029.
21. Prescott, J. *Taste Matters: Why We like the Foods We Do*. (2013).
22. Nurlela, L. Evaluasi Sensori Berbasis Konsumen pada Minuman Yuzu (*Citrus junos*) Komersial. Skripsi (IPB University, 2023).



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