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# Preliminary Hedonic Evaluation Of Reformulated Mentsuyu Using Local Lombok Ingredients

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**ABSTRACT**

Reformulating mentsuyu using local ingredients to support the development of products that meet halal requirements may affect consumer acceptance. This study aimed to evaluate the hedonic acceptance of reformulated mentsuyu made with local Lombok ingredients, using Japanese mentsuyu as a reference product, and to identify attributes that could be prioritized in subsequent formulation evaluations. The study employed a descriptive quantitative approach with a paired evaluation design involving ten Japanese panelists purposively selected based on their experience with and familiarity with mentsuyu. The panelists evaluated two samples: reformulated mentsuyu made with local Lombok ingredients and Japanese mentsuyu as the reference product. A five-point hedonic scale was used to assess six attributes: color, aroma, taste, umami intensity, aftertaste, and overall acceptance. Data were analyzed descriptively using means, medians, standard deviations, and differences between sample means. The reformulated sample had higher mean scores on five of the six attributes, while the mean aftertaste scores were identical. The largest mean difference was observed for umami intensity (0.40), followed by taste (0.30), whereas color showed the smallest difference (0.10). The difference in overall acceptance was also relatively small (0.20). These findings indicate that the reformulated mentsuyu received hedonic ratings that were descriptively close to those of the reference product among the panelists assessed. Taste and the umami-related attribute may be prioritized in further evaluation based on the differences in scores between samples. The findings provide preliminary information to support the further development of reformulated mentsuyu using local Lombok ingredients.

**Keywords**: local Lombok ingredients; hedonic evaluation; mentsuyu; product refinement; halal products.

## INTRODUCTION

Food product development involves not only creating new formulations but also considering consumer acceptance of the resulting products. Changes to ingredients or composition during reformulation may affect product characteristics and consumer responses. In their systematic review of intrinsic and extrinsic attributes of reformulated foods, Bolha et al. (2021) highlighted the importance of product attributes in consumer acceptance. Evaluating acceptance is therefore an important step in assessing the potential of a reformulated product before further development.

Food products may also be reformulated to meet particular consumer needs and requirements, including halal requirements. In the context of Japanese food products, halal status is one consideration in product development for Muslim consumers. Saville and Mahbubi (2021) examined Muslim travellers' food preferences in Japan and demonstrated the relevance of halalness in food choice. However, ingredient adjustments are not solely concerned with meeting such requirements; the acceptance of the resulting product must also be considered. Changes in composition may affect consumer responses, making post-reformulation evaluation necessary to obtain an initial understanding of product acceptance.

Mentsuyu is a Japanese food product used as a soup base and seasoning in a variety of dishes. Its formulation typically combines dashi, shoyu, and sweetening ingredients that contribute to its taste characteristics. In some traditional formulations, hon-mirin and cooking sake are used to create a balance of taste and aroma. Developing a formulation intended to meet halal requirements may involve modifying these ingredients. Such changes, however, may affect acceptance of the final product. Nishida et al. (2025) investigated perceived saltiness in animal- and plant-based mentsuyu, highlighting the relevance of ingredient composition to sensory research on this product. Sensory evaluation, including consumer-based approaches, can provide information about responses to developed or reformulated food products (Lawless & Heymann, 2010; Ares & Varela, 2018).

The use of local ingredients creates opportunities to develop formulations that draw on regional food resources. Local ingredients serve not only as product components but may also be associated with cultural values and culinary experiences. Andih et al. (2025) examined the relationship between cultural value, knowledge, and local product quality and tourists' consumption experiences, while Toader et al. (2022) discussed the role of local gastronomic businesses in gastronomic tourism development. This literature provides context for the potential role of local food resources in product development. In this study, local Lombok ingredients were used to reformulate mentsuyu, with honey and palm sugar replacing hon-mirin and cooking sake. This approach connects the use of local ingredients with efforts to adapt a formulation for halal-oriented product development.

Acceptance of products originating from different culinary traditions may also be influenced by consumers' familiarity with those products. Jin and Hwang (2024) discussed the relationship between cultural familiarity and consumer responses to ethnic foods, including liking and perceived authenticity. Research on food authenticity also indicates that product evaluations may be associated with characteristics consumers link to a particular product or culinary tradition (Antón et al., 2019; Ab-Latif et al., 2024). This perspective is relevant to evaluating reformulated mentsuyu with Japanese panelists who are familiar with the product. Their assessments can provide an initial indication of acceptance of a formulation that uses ingredients different from those in the reference product.

Although previous studies have addressed food reformulation, mentsuyu characteristics, halal food preferences, and consumer responses to ethnic foods, information on the hedonic acceptance of reformulated mentsuyu made with local Lombok ingredients remains limited. Comparison with Japanese mentsuyu as a reference product can provide preliminary information about acceptance patterns across the attributes assessed. The purpose of this comparison is not to establish the superiority or equivalence of the two products, but to identify attributes with differing scores that may warrant attention in subsequent formulation development.

Accordingly, this study aimed to evaluate the hedonic acceptance of reformulated mentsuyu made with local Lombok ingredients in comparison with Japanese mentsuyu as a reference product. The evaluation covered color, aroma, taste, umami intensity, aftertaste, and overall acceptance, based on assessments by Japanese panelists familiar with mentsuyu. The study is expected to provide preliminary information on acceptance of the reformulated product and identify attributes that may be prioritized in further evaluation of mentsuyu developed using local Lombok ingredients.

## METHOD

### Research Design and Samples

This study employed a descriptive quantitative approach with a paired hedonic evaluation design. The design was used to compare panelists' assessments of two mentsuyu samples evaluated by the same panelists. Hedonic evaluation was used to obtain an indication of liking for the product based on predefined attributes (Lawless & Heymann, 2010).

Two samples were included. Sample A was reformulated mentsuyu made with local Lombok ingredients, whereas Sample B was Japanese mentsuyu used as the reference product. The comparison was intended to describe the hedonic acceptance of the reformulated formulation based on the panelists' assessments.

Sample A was reformulated by a trained chef from Lombok who is Muslim. The reformulation was undertaken to adjust the ingredient composition in line with the development of a halal-oriented product. Specifically, hon-mirin and cooking sake, which are commonly used in some traditional mentsuyu recipes, were replaced with honey and Lombok palm sugar.

Sample B was Japanese mentsuyu used as the reference product in the evaluation. Traditional mentsuyu generally contains a combination of dashi, shoyu, sweeteners, and other seasoning ingredients. Dashi may include kombu and katsuobushi, while shoyu contributes saltiness, color, and fermented soybean characteristics. The reference formulation used in this study appeared to include ingredients that may contain alcohol, particularly hon-mirin and cooking sake. These ingredients are commonly used in Japanese food preparation to contribute balance, aroma, and depth of flavor.

### Panelists

Ten Japanese panelists were purposively selected based on their experience with and familiarity with mentsuyu. They included professional chefs, kitchen staff or assistant chefs, and Japanese individuals who regularly consumed or used mentsuyu. The panelists were selected to obtain assessments from individuals with experience of the reference product.

### Attributes and Hedonic Evaluation Instrument

The evaluation covered six attributes: color, aroma, taste, umami intensity, aftertaste, and overall acceptance. The first five attributes were used to assess aspects of the product, while overall acceptance was recorded as a separate measure. A structured evaluation sheet was used consistently for both samples.

Panelists rated the samples using a five-point hedonic scale, ranging from 1 (strongly dislike) to 5 (strongly like). The scale was used to describe panelists' liking of the attributes assessed and their overall acceptance of the product.

### Evaluation Procedure

Each panelist evaluated Sample A and Sample B using the same instrument. The samples were presented with coded labels to reduce the influence of product identity on ratings. Panelists then rated each attribute and overall acceptance using the specified scale.

The paired design allowed the two samples to be compared using responses from the same panelists. Details concerning presentation order, testing conditions, and control procedures should be reported in accordance with the procedures actually used in the study.

**Data Analysis**

The data were analyzed descriptively using the mean, median, and standard deviation for each attribute in each sample. Differences between sample means were calculated to describe the magnitude of score differences. Smaller differences indicate closer mean scores for the relevant attribute, whereas larger differences indicate greater differences between the mean scores.

The analysis was used to describe hedonic acceptance of the reformulated mentsuyu relative to the reference product and to identify attributes that could be prioritized in further formulation evaluation. The analysis was not intended to establish the statistical superiority or equivalence of the two samples.

## RESULT AND DISCUSSION

### Result

The results of the hedonic evaluation of reformulated mentsuyu made with local Lombok ingredients (Sample A) and Japanese mentsuyu as the reference product (Sample B) are presented in Table 1. The evaluation covered six attributes: color, aroma, taste, umami intensity, aftertaste, and overall acceptance. Ratings were recorded on a five-point hedonic scale, from 1 (strongly dislike) to 5 (strongly like). The data are presented as means, standard deviations, medians, and differences between sample means..

**Table 1. Descriptive Statistics of the Sensory Evaluation of Mentsuyu**

| Attribute | Sample A M ± SD | Median | Sample B M ± SD | Median | Mean Difference |
|---|---|---|---|---|---|
| **Color** | 4.40 ± 0.84 | 5.00 | 4.30 ± 0.82 | 4.50 | 0.10 |
| **Aroma** | 4.00 ± 0.82 | 4.00 | 3.80 ± 0.92 | 3.50 | 0.20 |
| **Taste** | 4.20 ± 0.79 | 4.00 | 3.90 ± 0.57 | 4.00 | 0.30 |
| ***Umami* intensity** | 4.20 ± 0.79 | 4.00 | 3.80 ± 1.03 | 4.00 | 0.40 |
| ***Aftertaste*** | 4.00 ± 0.94 | 4.00 | 4.00 ± 0.82 | 4.00 | 0.00 |
| **Overall acceptance** | 4.10 ± 0.99 | 4.50 | 3.90 ± 0.88 | 4.00 | 0.20 |

*Source: Primary data, processed in 2026.*

Sample A had higher mean scores than Sample B on five of the six attributes assessed. The mean aftertaste scores were identical. The largest difference in means was observed for umami intensity (0.40), followed by taste (0.30), aroma and overall acceptance (0.20 each), and color (0.10).

Mean scores ranged from 4.00 to 4.40 for Sample A and from 3.80 to 4.30 for Sample B. Both ranges were around the "like" category on the scale used. The two samples also had identical medians for taste, umami intensity, and aftertaste. The median scores for Sample A were higher for color, aroma, and overall acceptance.

Overall, the two samples showed relatively close patterns of hedonic acceptance across the six attributes. Sample A had higher mean scores on most attributes, while the mean aftertaste scores were identical. This descriptive pattern provides an initial indication of acceptance of reformulated mentsuyu made with local Lombok ingredients compared with the Japanese reference product.

## Discussion

Reformulating mentsuyu with local Lombok ingredients to support halal-oriented product development raises the question of how acceptance is affected when the ingredient composition is changed. The results showed that the reformulated mentsuyu received hedonic acceptance scores relatively close to those of Japanese mentsuyu used as the reference product. This pattern provides an initial indication that the formulation changes were not accompanied by a consistent decline in liking across all attributes assessed. This finding is consistent with Bolha et al. (2021), who emphasized the importance of product attributes in consumer acceptance of reformulated foods. Hedonic evaluation can therefore provide preliminary information for assessing the potential of a new formulation before further development.

The assessment by Japanese panelists familiar with mentsuyu is important for interpreting these findings. Familiarity with the product provides context for evaluating a formulation that uses ingredients different from those in the reference product. Jin and Hwang (2024) discussed the relationship between cultural familiarity and consumer responses to ethnic foods, including liking and perceived authenticity. In this study, the relatively close acceptance scores indicate that the reformulated formulation received favorable hedonic responses from the panelists who had experience with mentsuyu. This provides an initial indication of product acceptance within the panelist group assessed.

Differences in scores between the samples also provide information for determining the direction of subsequent formulation evaluation. The largest mean difference was observed for umami intensity, followed by taste, whereas the difference for color was small and the mean aftertaste scores were identical. This pattern indicates that differences in ratings were not evenly distributed across all attributes. Taste and the umami-related attribute may therefore be prioritized in further evaluation to obtain a more detailed understanding of panelists' responses to the reformulated product. However, the magnitude of a score difference alone does not establish that an attribute is problematic or that a particular ingredient change caused the difference. Further assessment requires controlled comparisons of formulations and an instrument appropriate to the characteristic being measured.

The use of local Lombok ingredients in reformulating mentsuyu also illustrates the potential to use regional food resources in developing products rooted in different culinary traditions. Andih et al. (2025) examined the relationship between cultural value, knowledge, and

local product quality and tourists' consumption experiences, while Toader et al. (2022) discussed the role of local gastronomic businesses in gastronomic tourism development. These studies provide context for the links between local food resources, product development, and culinary experiences. In this study, honey and Lombok palm sugar were used to replace ingredients in the mentsuyu formulation, and the resulting product was assessed through panelists' hedonic responses. The formulation received liking scores relatively close to those of the reference product, providing an initial basis for exploring the use of local ingredients in products from other culinary traditions.

Overall, this study contributes preliminary information on the hedonic acceptance of reformulated mentsuyu made with local Lombok ingredients, based on assessments by Japanese panelists familiar with the product. The closeness of the scores provides an initial indication of acceptance, while variation in the differences across attributes helps guide subsequent evaluation. These findings can inform more controlled formulation development, particularly to examine responses to taste and umami. Further research is also needed to distinguish liking ratings from measurements of sensory intensity and to evaluate alternative formulations in greater detail.

## CONCLUSION

Reformulated mentsuyu made with local Lombok ingredients received hedonic acceptance scores that were descriptively close to those of Japanese mentsuyu used as the reference product. The reformulated sample had higher mean scores on five of the six attributes assessed, while the mean aftertaste scores were identical. The largest mean differences were observed for umami intensity and taste, whereas color showed the smallest difference. These findings provide an initial indication of acceptance of the reformulated mentsuyu based on assessments by Japanese panelists familiar with the product.

Based on the descriptive differences in scores, taste and the umami-related attribute may be prioritized in further formulation evaluation. However, the magnitude of the score differences does not establish that these attributes are problematic or identify a specific ingredient as the cause of the differences. Evaluating several controlled formulations would help clarify the relationship between ingredient changes and product acceptance.

This study provides preliminary evidence on the hedonic acceptance of reformulated mentsuyu made with local Lombok ingredients. The findings are limited to an initial evaluation involving ten purposively selected panelists and descriptive analysis. They therefore cannot be generalized to Japanese consumers as a whole. Future studies should involve a more diverse panel, distinguish liking from sensory-intensity measurements, and compare formulations under controlled conditions to develop a more detailed understanding of acceptance of reformulated mentsuyu made with local Lombok ingredients.

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