

## Factors associated with taste satisfaction in Hajj catering meals and their implications for health

*Faktor-Faktor yang Berkaitan dengan Kepuasan Rasa pada Makanan Katering Haji dan Implikasinya bagi Kesehatan*

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### ABSTRACT

**Background:** Large-scale Hajj catering requires efficiency without compromising taste quality. The use of ready-to-use spice paste improves efficiency and consistency but may affect sensory quality. Taste satisfaction is also influenced by food handlers' perception and experience.

**Objective:** This study aimed to analyze factors associated with taste satisfaction in Hajj catering, including the use of ready-to-use spice paste, perceived importance of its use, and work experience of food handlers.

**Methods:** A cross-sectional design with a quantitative approach supported by qualitative data was used. Data were collected through questionnaires from 31 catering staff selected by purposive sampling and semi-structured interviews. Analysis was performed using Fisher's Exact test and Odds Ratio (OR) ( $\alpha=0.05$ ).

**Results:** The use of ready-to-use spice paste and the perceived importance of its use were significantly associated with taste satisfaction ( $p<0.05$ ). Perceived importance of spice paste use showed the strongest association with taste satisfaction (OR=9.90; 95% CI: 1.80–54.00). Work experience was not significantly associated with taste satisfaction ( $p>0.05$ ). Most respondents reported moderate satisfaction with meal taste. Qualitative findings showed that chefs performed flavor fine-tuning to maintain sensory quality despite the use of ready-to-use spice paste.

**Conclusion:** Taste satisfaction in Hajj catering meals is influenced by technical and perceptual factors related to spice paste use. Maintaining sensory quality through flavor adjustment remains important to support food acceptance. Further studies using direct health indicators are needed to confirm the health implications.

**Keywords:** hajj catering, taste satisfaction, spice paste, food handlers, sodium

### ABSTRAK

**Latar Belakang:** Penyelenggaraan katering haji skala besar menuntut efisiensi tanpa mengabaikan kualitas rasa makanan. Penggunaan bumbu jadi paste dapat meningkatkan efisiensi dan konsistensi pengolahan, namun berpotensi memengaruhi kualitas sensori. Kepuasan rasa juga dipengaruhi oleh persepsi dan pengalaman tenaga pengolah makanan.

**Tujuan:** Penelitian ini bertujuan menganalisis faktor-faktor yang berhubungan dengan kepuasan rasa makanan katering haji, meliputi penggunaan bumbu jadi paste, kepentingan penggunaannya, dan pengalaman kerja tenaga pengolah makanan.

**Metode:** Penelitian menggunakan desain cross-sectional dengan pendekatan kuantitatif yang didukung data kualitatif. Data dikumpulkan melalui kuesioner pada 31 tenaga katering yang dipilih secara purposive serta wawancara semi-terstruktur. Analisis dilakukan menggunakan uji Fisher's Exact dan Odds Ratio (OR) dengan tingkat signifikansi  $\alpha=0,05$ .

**Hasil:** Penggunaan bumbu jadi paste dan kepentingan penggunaannya berhubungan signifikan dengan kepuasan rasa ( $p<0,05$ ). Kepentingan penggunaan bumbu

menunjukkan hubungan paling kuat dengan kepuasan rasa (OR=9,90; 95% CI: 1,80–54,00). Pengalaman kerja tidak menunjukkan hubungan yang signifikan secara statistik ( $p>0,05$ ). Mayoritas responden berada pada kategori cukup puas terhadap rasa makanan. Temuan kualitatif menunjukkan bahwa koki melakukan penyesuaian rasa (flavor fine-tuning) untuk mempertahankan kualitas sensori makanan meskipun menggunakan bumbu jadi paste.

**Kesimpulan:** Kepuasan rasa makanan catering haji dipengaruhi oleh faktor teknis dan persepsi terkait penggunaan bumbu jadi paste. Upaya mempertahankan kualitas sensori melalui penyesuaian rasa tetap penting untuk mendukung penerimaan makanan. Penelitian lanjutan dengan pengukuran indikator kesehatan secara langsung masih diperlukan untuk mengkonfirmasi implikasi kesehatan tersebut.

**Kata kunci:** catering haji, kepuasan rasa, pasta rempah-rempah, penanganan makanan, natrium

## INTRODUCTION

Catering for Indonesian Hajj pilgrims in Saudi Arabia is a crucial component in ensuring the smooth implementation of the pilgrimage by providing adequate, safe food that meets the pilgrims' dietary preferences. This service is provided on a large scale, with consistent quality requirements, including ensuring the taste of the food reflects the characteristics of Indonesian cuisine.<sup>1</sup> The production capacity of the Hajj catering kitchen, which can reach 3,500–5,000 portions per day in dozens of kitchens, shows the complexity of the food supply system, which must be managed efficiently without neglecting the quality of the cooking results.<sup>2</sup>

In practice, the implementation of Hajj catering services faces various challenges related to large-scale food production, including maintaining food quality, safety, and consistency of taste for Indonesian pilgrims. According to the Indonesian Ministry of Religious Affairs, the Hajj catering system involves dozens of catering kitchens with production capacities reaching thousands of meal portions per day, reflecting the complexity of managing food preparation and distribution during the Hajj season.<sup>3,2</sup> One of the main challenges is maintaining the quality of the taste of Indonesian cuisine, which generally uses fresh spices with complex compositions, amidst the need for large-scale production efficiency.<sup>4</sup> This condition encourages innovation in the use of more practical raw materials without reducing the taste accepted by the congregation.<sup>5</sup>

In response to these challenges, the use of ready-to-use spice paste has begun to be adopted as an operational strategy to simplify the production process, reduce preparation time, and improve the consistency of cooking results through collaboration with MSMEs and food producers in Indonesia.<sup>6,7</sup> The use of ready-to-use spices has been proven to increase time efficiency and reduce labor requirements in large-scale food processing.<sup>8</sup> However, the processing of processed spices, such as heating, has the potential to affect the flavor characteristics of food due to the degradation of flavor-forming compounds.<sup>9,10</sup>

In large-scale foodservice, sensory evaluation is a crucial component in determining consumer acceptance of food. Research shows that sensory attributes such as taste, aroma, and mouthfeel are significantly related to consumer satisfaction with food service. Furthermore, sensory quality perceptions also play a role in shaping overall liking and acceptance of processed and ready-to-eat food products.<sup>11,12</sup>

Several studies related to sodium reduction in food products have shown that changes in salt composition and the use of processed ingredients can affect the sensory profile of foods, including saltiness, aroma, and overall flavor. While food reformulation is necessary to improve efficiency and health, maintaining consumer acceptance remains

a major challenge in food product development and catering services.<sup>13,14</sup> In this context, the use of ready-to-use spices in Hajj catering services is relevant to study because it has the potential to affect the sensory quality and acceptance of food by pilgrims.

Taste quality is a key indicator of consumer acceptance of food, including in the context of Hajj catering. Satisfaction with taste influences food consumption and is indirectly related to the health of pilgrims during the pilgrimage.<sup>15,16</sup> Based on the results of the 2025 Indonesian Hajj Pilgrim Satisfaction Survey, the consumption service indicator shows a high satisfaction value, with a score of 89.41 for non-Armuzna consumption and around 83 points for Armuzna consumption (Arafah, Muzdalifah, Mina), both of which are included in the satisfactory to very satisfactory category. This reflects relatively good level of acceptance of the food provided.<sup>17,18</sup>

However, taste satisfaction is influenced not only by ingredients but also by human factors, such as work experience and the food processor's perception of seasoning. These factors play a role in determining the final product through the process of flavor adjustment during preparation. In this context, the chef's skill in flavor fine-tuning is a crucial aspect in maintaining food quality, especially when using ingredients with varying sensory characteristics.

Although the use of seasoning pastes in the catering industry has been extensively researched, most previous studies have focused on food composition or general sensory quality, without linking these to the behavioral factors of food handlers. Furthermore, studies integrating perceptions of seasoning use, work experience, and taste satisfaction in the context of Hajj catering are still limited.

This study offers novelty by integrating technical and behavioral factors in analyzing the taste satisfaction of Hajj catering food. Not only does it assess the use of seasoning paste, but it also considers the importance of its use and work experience as key determinants. Furthermore, this study is enriched with qualitative findings that explain the mechanism of flavor fine-tuning by chefs and identify a "tolerance threshold" for flavor in the context of Hajj pilgrim consumption. Thus, this study provides a more comprehensive perspective on the relationship between seasoning use, human factors, and taste satisfaction, as well as its implications for health aspects. Based on this background, this study aims to analyze factors related to taste satisfaction of Hajj catering food, specifically the use of seasoning paste, the importance of its use, and the work experience of food processing personnel.

## **METHODS**

### **Study design**

This study employed a cross-sectional design with a quantitative approach supported by qualitative data. The quantitative approach was used to analyze the relationship between the use of seasoning paste, work experience, and perceptions of food taste quality in Hajj catering services. Qualitative data were used to support the interpretation of the quantitative results through semi-structured interviews with catering staff and chefs regarding food processing practices and flavor adjustment strategies. The study was conducted during the Hajj season from June to July 2025 in Mecca and Medina, Saudi Arabia.

### **Data source and sampling procedure**

The primary data in this study were obtained through structured questionnaires and semi-structured interviews. The questionnaires were used to collect quantitative data related to respondent characteristics, use of seasoning paste, and taste satisfaction levels. Interviews were conducted with catering operational staff to gain in-depth

information regarding food processing practices and perceptions of seasoning use in relation to taste quality.

The sampling technique used was purposive sampling, which was chosen because this study requires respondents with specific characteristics, namely, catering workers directly involved in food processing and having experience in using seasoning paste. This approach allows researchers to obtain more relevant and specific data in accordance with the research objectives, compared to random sampling techniques that could potentially involve respondents who have no direct relationship with the variables studied. The sample in this study amounted to 31 catering workers.

Respondents included in this study were catering staff who served as cooks or were directly involved in food processing, had at least one year of work experience in the catering industry, and used seasoning paste in their daily cooking practices. Furthermore, respondents were required to be willing to participate and complete the questionnaire. Conversely, respondents not directly involved in food processing, such as those in distribution or administration, were excluded from this study. Respondents who did not complete the questionnaire completely or had inconsistent data were also excluded from the analysis.

#### **Variables of the study**

The variables in this study consist of dependent and independent variables. The dependent variable is satisfaction with food taste, while the independent variables include the use of seasoning paste, the importance of its use, and the work experience of food processors. These variables were chosen because they are directly related to the processing process and perceptions of food taste quality.

#### **Measurement and instruments**

Data were measured using a structured questionnaire with a Likert scale of 1–5 to assess perceptions of food taste quality and respondents' perceptions of the use of seasoning paste in Hajj catering food processing. The assessment scale ranged from very dissatisfied to very satisfied. The questionnaire also included respondent characteristics, including age, work experience, and frequency of seasoning paste use in cooking. The research instrument was developed based on a literature review related to food sensory evaluation and foodservice quality.<sup>19</sup> The use of Likert scales and sensory evaluation approaches is commonly used in food research to measure taste perception and consumer acceptance of food products.

Prior to use, the instrument underwent a limited face validity test on catering staff to ensure language clarity and the appropriateness of the questions to the research context. Because each perceptual variable was measured using a single-item measure, internal reliability tests such as Cronbach's alpha were not performed. The single-item approach was deemed appropriate for measuring subjective perceptions that are direct and specific.

For bivariate analysis, taste quality perception scores were then categorized into two groups: dissatisfied and satisfied. Seasoning paste usage was also categorized into low and high based on frequency of use, while the perceived importance of seasoning use was categorized into low and high based on respondents' assessment scores. In addition to quantitative data collection, semi-structured interviews were conducted with several catering staff and chefs to obtain supporting information regarding food processing practices and flavor adjustment strategies during cooking.

#### **Data collection**

Data were collected through the distribution of structured questionnaires to catering staff directly involved in food processing at Hajj catering services in Saudi Arabia. The questionnaires were completed in person with the assistance of the research team to

minimize incomplete data and ensure that all questions were fully understood by respondents. The questionnaires were used to obtain information on respondent characteristics, frequency of use of seasoning paste, perceptions of the importance of seasoning use, and perceptions of the taste quality of the resulting food. Additionally, semi-structured interviews with chefs and operational managers were conducted to gain more in-depth information on food processing practices and flavor adjustment strategies. The research team conducted data collection systematically in accordance with established procedures.

**Ethical considerations**

This research has obtained ethical approval with No. 595/KEPK/EC/III/2026 from the Health Ethics Committee of the Poltekkes Kemenkes Bandung. All respondents provided informed consent before participating, and data confidentiality was maintained by not including personal identification.

**Data analysis**

Descriptive analysis was used to describe the characteristics of respondents and the distribution of research variables. The relationship between the use of seasoning paste, the perceived importance of seasoning use, and work experience with the perception of food taste quality was analyzed using Fisher's Exact Test due to the relatively small sample size and the expected count of less than five in the contingency table. The magnitude of the relationship is expressed as an Odds Ratio (OR) with a 95% Confidence Interval (CI). A p-value <0.05 is considered statistically significant. Interview data were analyzed thematically to support the interpretation of the quantitative results.

**RESULTS**

**Table 1. Respondent Characteristics and Perceptions towards the Use of Ready-to-Use Seasonings (n=31)**

Variables	Category	n	%
Age (years)	18–30	3	9.7
	31–40	17	54.8
	41–50	8	25.8
	≥51	3	9.7
Work experience	1–3 years	6	19.4
	4–6 years	6	19.4
	>6 years	19	61.3
Use of seasoning paste	1–2 times	7	22.6
	3–4 times	9	29.0
	5–6 times	7	22.6
	>6 times	8	25.8
Satisfaction of taste	Very dissatisfied	1	3.2
	Not satisfied	7	22.6
	Quite satisfied	10	32.3
	Satisfied	9	29.0
	Very satisfied	4	12.9

Table 1 shows that the majority of respondents were in the 31–40 age group (54.8%) and had more than 6 years of work experience (61.3%). This indicates that most respondents were catering workers with experience in large-scale food processing.

The frequency of use of seasoning pastes was relatively widespread across all categories, with the largest proportion being used 3–4 times per week (29.0%). This finding indicates that seasoning pastes have become part of catering food processing practices, although their use is not yet fully dominant.

Based on the perception of taste quality, the majority of respondents gave a rating of “quite satisfied” (32.3%) and “satisfied” (29.0%). However, there were still respondents who stated “not satisfied” (22.6%), which indicates a variation in perception of the taste quality of the food, which is produced using spices to make a paste.

**Table 2. Analysis of the Relationship between Factors and Taste Satisfaction (Fisher's Exact Test)**

Variables	Category	Dissatisfied n (%)	Satisfied n (%)	p-value	OR (95% CI)
Use of seasoning paste	Low	12 (75.0)	4 (25.0)	0.048	4.50 (1.05–19.30)
	High	6 (40.0)	9 (60.0)		
Perceived importance of use	Low	9 (81.8)	2 (18.2)	0.010	9.90 (1.80–54.00)
	High	5 (31.3)	11 (68.7)		
Work experience	≤6 years	6 (50.0)	6 (50.0)	0.462*	1.80 )
	>6 years	3 (20.0)	12 (80.0)		

Information:

Statistical analysis was performed using Fisher's Exact Test.

Low seasoning paste use = 1–4 times; high use = ≥5 times.

Low perceived importance = Likert score 1–3; high perceived importance = score 4–5.

Dissatisfied taste quality perception = Likert score 1–3; satisfied = score 4–5.

Not statistically significant ( $p > 0.05$ ).

Table 2 shows that the use of seasoning paste was significantly associated with perceived food taste quality ( $p=0.048$ ). Respondents with a higher frequency of seasoning paste use were more likely to report better taste quality compared to those with a lower frequency of use (OR=4.50; 95% CI: 1.05–19.30).

The perceived importance of seasoning paste use was also significantly associated with perceived food taste quality ( $p=0.010$ ). Respondents who considered seasoning paste important in food preparation were more likely to provide positive taste ratings than those with lower perceived importance (OR=9.90; 95% CI: 1.80–54.00).

Work experience was not significantly associated with perceived food taste quality ( $p=0.462$ ). Although respondents with more than six years of work experience showed a slightly higher proportion of positive assessments than those with six years or less of work experience, the association was weak and accompanied by a wide confidence interval (OR=1.80; 95% CI: 0.39–8.28).

### Qualitative Findings: The Role of Chefs in Maintaining Flavor Enhancement

Interviews revealed that using seasoning pastes offers efficiency benefits, but still requires adjustments to maintain the quality of the food's flavor. Chefs identified that using seasoning pastes sometimes results in a less intense flavor, leading to a strategy of fine-tuning flavors by adding fresh ingredients at the final stage of the cooking process.

As stated by one informant:

"Using seasoning paste is faster, but the flavor doesn't come out as well. We usually add lime leaves or lemongrass at the end to liven up the flavor."

These findings suggest that chef skill and experience play a significant role in maintaining taste quality. This aligns with quantitative results showing a relationship between work experience and taste satisfaction.

### **Qualitative Findings: Perception of the Importance of Using Spices**

Interviews also revealed that perceptions of the importance of spices influence the final outcome of a dish. Informants who consider spices an important component tend to be more proactive in adjusting flavors.

"The seasoning is the key to flavor. Even if you use paste, you still have to adjust it."

This finding supports the quantitative results, which show that the importance of using spices is the most dominant factor in taste satisfaction.

## **DISCUSSION**

This study shows that satisfaction with the taste of Hajj catering food is influenced by the use of seasoning paste, the purpose of its use, and the experience of the food processors. These findings confirm that taste quality is determined not only by ingredients but also by human factors and perceptions during the preparation process.

The use of seasoning pastes is significantly associated with taste satisfaction. This aligns with literature suggesting that processed ingredients, such as instant seasonings, are designed to enhance food palatability through consistent flavor composition. Furthermore, in the context of large-scale catering services, the use of seasoning pastes is also associated with operational efficiency, including ease of processing and product consistency. Previous studies have shown that suboptimal operational management, such as delayed food distribution, can decrease customer satisfaction.<sup>20</sup> Therefore, increasing efficiency through the use of seasoning paste can indirectly support the level of acceptance of taste quality, especially in mass service situations such as Hajj catering.

However, the use of these ingredients also has health implications, particularly related to the high sodium content in processed products. Research by Istiqomah (2021) shows that most processed foods do not meet the WHO's recommended sodium standards.<sup>21,22</sup> Furthermore, instant seasonings in Indonesia are reported to contain quite high levels of sodium, capable of meeting more than 50% of the daily requirement in a single serving. This suggests that enhancing taste satisfaction through the use of seasoning pastes needs to be balanced with controlling nutritional composition.<sup>23</sup>

Perceptions of food taste quality in Hajj catering services are not only related to sensory perception but also have the potential to influence food consumption by pilgrims. Previous research has shown that food taste acceptance is related to consumption levels and nutrient adequacy, especially in groups with vulnerable physical conditions or high activity levels. In the context of the Hajj, adequate food intake is crucial because pilgrims undergo quite strenuous physical activity and are exposed to extreme environmental conditions, such as high temperatures and the density of worship activities.

Although this study did not directly measure health indicators, such as nutritional intake, hydration status, or pilgrims' health status, the findings regarding perceived taste quality still have important implications for food service management. Food with good taste acceptance has the potential to increase food consumption and help maintain pilgrims' energy levels during the Hajj. Therefore, the sensory quality of food still needs to be considered, along with operational efficiency aspects, in the Hajj catering system.

The importance of seasoning was the factor most strongly associated with taste satisfaction. This indicates that food handlers' perceptions and attitudes play a significant role in determining the quality of the resulting dish. This finding is supported by research showing that taste preferences and perceptions significantly influence food acceptance, even in the context of compositional modifications such as sodium reduction.<sup>24</sup> Thus, cognitive and behavioral factors become important elements in producing optimal taste

quality. The fairly strong relationship between the importance of the use of spices is likely influenced by the similarity of respondents' perceptions of the use of spices and the assessment of taste quality, which is measured subjectively using a self-report instrument.

Work experience in this study did not show a statistically significant relationship with perceived food taste quality. However, respondents with more than six years of work experience had a slightly higher proportion of positive assessments than those with less experience. These results suggest that work experience likely plays a role in food processing, but its influence could not be statistically proven in this study.

Qualitative findings indicate that chefs play a significant role in flavor fine-tuning, particularly when using seasoning pastes. These adjustments are made through the addition of fresh aromatic ingredients, such as lemongrass, bay leaves, and lime leaves, to maintain the characteristic flavors of Indonesian cuisine. This practice demonstrates that practical skills and cooking experience are still essential for maintaining consistent flavor in large-scale catering systems. From a food technology perspective, sensory limitations in processed seasonings can arise from processing processes, such as heating and pasteurization, which can potentially lead to the degradation of flavor-forming compounds. Previous research has shown that the degradation of volatile compounds during thermal processing can affect the aroma and flavor characteristics of food.<sup>9</sup> Therefore, the ability of food processing personnel to adjust flavors is an important aspect to help maintain sensory acceptance of food, especially when using processed spices in mass foodservice systems.

Overall, the results of this study indicate that taste satisfaction is the result of an interaction between ingredients (spices), human factors (experience and perception), and the consumption context. Therefore, a balanced approach between operational efficiency, taste quality, and health aspects is crucial in implementing Hajj catering. This also aligns with Wei's (2021) research, which showed that in the structure of service satisfaction, basic attributes such as food safety and timeliness have a more dominant influence than sensory attributes, which act as complementary factors.<sup>25</sup> Thus, the quality of taste that is at the "quite satisfactory" level is still acceptable as long as the basic service needs are met.

The results of this study provide practical and theoretical implications for the implementation of Hajj catering. Practically, the use of seasoning paste can support the consistency and efficiency of food processing, but still requires control and adjustment by processing personnel to maintain taste quality. Therefore, guidelines for the use of seasoning paste that consider the balance between efficiency and sensory quality are needed. Furthermore, the importance of perceptions regarding seasoning use suggests that training and capacity building among catering personnel are crucial. Training programs that focus on flavor management and seasoning adjustment techniques can improve the overall quality of dishes. From a health perspective, the use of processed seasonings needs to be controlled, particularly regarding sodium content. Therefore, better supervision and formulation are needed to maintain food quality without increasing health risks for pilgrims. Furthermore, compliance with Hajj pilgrims' nutritional needs is also an important indicator in ensuring the quality of consumption services.<sup>26</sup>

This study has several strengths. First, it integrates technical factors (the use of seasoning paste) with human factors (the importance of use and work experience), thus providing a more comprehensive picture of the determinants of taste satisfaction. Second, this study not only uses a quantitative approach but is also supported by qualitative findings that are able to explain the mechanisms behind the statistically found relationships, such as the role of chefs in making taste adjustments. Third, this study was

conducted in the specific context of Hajj catering with its unique characteristics, thus providing an empirical contribution to the field of large-scale catering that is still relatively limited in research.<sup>9</sup>

This study has several limitations that need to be considered in interpreting the results. First, the relatively small sample size (n=31) may influence statistical power and precision of the estimates, as seen from the relatively wide range of confidence intervals for several variables. Second, the use of the purposive sampling technique means that the research results cannot be widely generalized because respondents were selected based on certain criteria and only represent catering personnel involved in Hajj catering food processing. Third, the cross-sectional design used in this study does not allow researchers to determine causal relationships, so the results obtained only show relationships or associations between variables. Fourth, several factors that could potentially influence the perception of taste quality, such as raw material prices, food quality, and individual preferences, have not been further analyzed statistically due to limitations in sample size and data distribution. Furthermore, this study did not directly measure health indicators, such as food consumption levels, nutrient intake, health complaints, or nutritional status of Hajj pilgrims. Therefore, the health implications discussed in this study are still theoretical, based on the literature on the relationship between food intake, food consumption, and nutritional adequacy.

## CONCLUSION

This study shows that the use of seasoning paste and the perceived importance of its use are associated with the perceived taste quality of Hajj catering food. Meanwhile, work experience did not show a statistically significant relationship, although more experienced caterers tended to provide better taste ratings. Qualitative findings indicate that chefs' skill in adjusting flavors plays a significant role in maintaining the sensory quality of food even when using processed seasonings.

In general, the taste quality of the food remained at an acceptable level, indicating a balance between processing efficiency and the quality of the finished product. Therefore, Hajj catering operators need to pay attention to the sensory quality of the food through training catering staff and developing food processing technologies that can maintain the food's flavor characteristics.

Food quality and taste remain a key consideration in Hajj catering services, as good food reception has the potential to support food consumption and adequate nutrition during the Hajj. However, further research with direct measurements of health indicators is needed to confirm these health implications.

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