



Consumer Preferences on Key Kombucha Attributes among Thais and Indonesians: A Conjoint Analysis Study for Advanced Food Product Development

Qurata A'yuni¹, Aussama Soontrunnarudrungsri², and Tantawan Pirak^{3*}

¹ Faculty of Agro-Industry, Kasetsart University, Bangkok, 10900, Thailand

² Faculty of Agro-Industry, Kasetsart University, Bangkok, 10900, Thailand

³ Faculty of Agro-Industry, Kasetsart University, Bangkok, 10900, Thailand

* Correspondence: tantawan.k@ku.th

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Abstract: Consumer preferences for healthier options have risen since post-pandemic COVID-19, thus consumers have increasingly consumed functional beverages, particularly “kombucha” due to its perceived health benefits. However, the key quality attributes that drive consumer choice when purchasing kombucha have not been well established. Hence, this study investigated the most preferred attribute of kombucha and its segmentation on consumer choices using conjoint-based rating analysis. A total of 241 participants from Thailand and Indonesia were involved in evaluating 27 concepts obtained from different combinations of each attribute level (e.g., sugar options, flavors, price, and health benefits). The results showed that consumers in both countries identified “reduced sugar content” as the most important kombucha attribute, although significant differences were found in other attribute preferences. Indonesians preferred the “original flavors” of kombucha and were willing to purchase at the “regular price” to gain the “antioxidant” benefits. Meanwhile, Thai consumers preferred kombucha with “natural fruity flavors” and sought more “affordable prices”, as it was driven by the “gut health” benefits. Consumer segmentation from both countries was identified using hierarchical cluster analysis: reduced sugar-driven, healthier options, antioxidants seekers, price-driven, and sweet-tooth cravers. These insights facilitate food developers and manufacturers create kombucha that follows the most preferred attributes to meet specific market and consumer demands.

Keywords: Consumer preferences; conjoint analysis; kombucha; quality attributes.

1. Introduction

The global outbreak of COVID-19 has shifted consumer preferences toward healthy and fermented drinks due to their perceived health benefits. Among these beverages, kombucha is a famous fermented tea that offers gut health benefits and improves the immune system owing to its symbiotic microbiota [1]. The popularity of kombucha is reinforced by market growth, reaching USD 5.9 billion and growing at a CAGR of 19.4% by 2029, particularly in Western countries. However, in Southeast Asia, kombucha remains sold in niche markets, and its functionality is still relatively unfamiliar to many consumers. Furthermore, habitual kombucha consumption is primarily observed among health-conscious individuals [2]. Hence, understanding the key attribute drivers of consumer preferences for kombucha is crucial for developing new products that meet the specific needs of target market segments.

Previous studies have highlighted the multi-attributes of kombucha, which are revealed across various consumer profiles with diverse market segments. Among these, sensory qualities, particularly flavor characteristics, are the essential attributes influencing the purchase decisions and intentions of the product. The flavor profile of kombucha is often described as mildly sweet, well-balanced sweetness-sourness, strong acetic, natural tea-fermented, fruity-floral, and authentic flavors [3]. In addition to flavor, the sugar option is considered critical for functional beverages, specifically in kombucha, to fit health-conscious consumers. Several products now feature sugar claims, such as reduced sugar and non-caloric sweeteners, to support body weight management and control blood glucose levels during daily consumption [4]. Another important attribute associated with kombucha is its health benefit claims, including digestive health improvement, antioxidant effects, and detoxification properties. Health benefit attributes strongly drive purchasing decisions for fermented beverages [3, 4]. According to market mapping, kombucha is currently most accessible to middle- and upper-class consumers, particularly within the premium market segment focused on healthier lifestyle choices. To expand its market reach, kombucha should become more accessible to consumers with a broader range of sociodemographic backgrounds, especially by offering affordability for lower-income consumers. In this context, price is a critical factor in affecting the purchasing decisions of functional beverages while gaining perceived product value and benefits without compromising quality and functionality [5]. No studies have identified the key kombucha attributes that drive consumer choice and purchase intentions to date.

Conjoint analysis has been widely used for various foods and beverages to identify consumer preferences for food product development, determine consumer segmentation, and conduct market simulations. The insights gained from conjoint studies are critical for food manufacturers to ensure that their products meet consumer needs and remain competitive in crowded markets [4, 6]. Ong et al. suggested that identifying the most critical product attributes enables product developers to design products that fulfill the consumer needs in specific segmented markets [6]. Lee et al. further demonstrated that consumers can be segmented based on the value benefits of product attributes [5]. Moreover, conjoint analysis aids in formulating marketing strategies to determine the most preferred product attributes and provides socio-demographic insights among consumers, which are crucial for long-term market success. Conjoint analysis has revealed that consumer preferences for product attributes vary between countries owing to differences in market segmentation and levels of understanding of product familiarity [4-6]. Cultural behaviors and consumption habits significantly influence the selection of specific product attributes, suggesting authentic preferences are shaped by cultural and socio-demographic factors [7]. Thus, conjoint analysis is valuable for identifying unique selling propositions and enhancing market opportunities.

Recent research has shown scarce information on consumer preferences for kombucha and its simulated market segmentation. Hence, this study aimed to investigate kombucha's key attributes using conjoint analysis, which consumers between Indonesians and Thais most preferred. The conjoint data was also used to determine consumer segmentation and specific kombucha attributes that fit consumer needs within specific target markets.

2. Materials and Methods

2.1 Design of conjoint analysis on the most valued key kombucha attributes

The selection of kombucha attributes and their levels for the conjoint study was determined through a focus group discussion (FGD) following a previous method [8]. The FGD involved twenty-six participants (n=26), aged between 18 and 37 years, among Thais and Indonesians, who had experienced drinking kombucha routinely. The FGD session included general and probing questions. Initially, the participants were asked about their knowledge of kombucha and their perceptions of its attributes. During the probing phase, participants identified the most preferred intrinsic and extrinsic kombucha attributes that drive consumer choice. The most frequently mentioned attributes during the FGD were selected for the conjoint study. The attributes and their levels for conjoint studies are revealed in Table 1.

Table 1. The attributes and levels of kombucha used for conjoint analysis

Parameters	Attributes	Levels
Intrinsic attributes	Flavors	Original Natural Fruity Flavors Fruity Flavor Added
	Sugar Options	Normal Sugar Reduced Sugar Sweeteners
Extrinsic attributes	Health Benefits	Antioxidant Good for Gut Health Without Health Benefits
	Price	Affordable Regular Premium

The experimental design for the conjoint analysis was determined based on a fractional factorial design, a statistical technique commonly used to reduce the number of experimental runs while maintaining statistical efficiency. The conjoint profiles were generated using the XLSTAT version 19.6 software (Addinsoft, New York, NY, USA), resulting in a total of 27 unique combinations of attributes (e.g., sugar options, flavors, health benefits, and price), and each corresponding level as shown in Table 2. The participants then evaluated each concept using a 9-point rating scale [8, 9].

Table 2. The product concepts used in the conjoint analysis to identify the most preferred attributes

No	Sugar Light	Health Benefits	Flavors	Price
1	Normal Sugar	Without Health Benefits	Natural Fruity Flavors	Premium
2	Less Sugar	Good for Gut Health	Natural Fruity Flavors	Premium
3	Normal Sugar	Good for Gut Health	Fruity Flavor Added	Premium
4	Less Sugar	Antioxidant	Natural Fruity Flavors	Premium
5	Sweeteners	Antioxidant	Natural Fruity Flavors	Affordable
6	Normal Sugar	Without Health Benefits	Fruity Flavor Added	Premium
7	Normal Sugar	Antioxidant	Fruity Flavor Added	Affordable
8	Normal Sugar	Good for Gut Health	Natural Fruity Flavors	Affordable
9	Sweeteners	Good for Gut Health	Original	Premium
10	Sweeteners	Good for Gut Health	Natural Fruity Flavors	Regular
11	Sweeteners	Without Health Benefits	Natural Fruity Flavors	Affordable
12	Sweeteners	Without Health Benefits	Original	Affordable
13	Normal Sugar	Antioxidant	Natural Fruity Flavors	Regular
14	Less Sugar	Without Health Benefits	Natural Fruity Flavors	Regular
15	Sweeteners	Without Health Benefits	Original	Premium
16	Less Sugar	Antioxidant	Original	Premium
17	Sweeteners	Antioxidant	Fruity Flavor Added	Premium
18	Less Sugar	Antioxidant	Original	Regular
19	Less Sugar	Without Health Benefits	Fruity Flavor Added	Regular
20	Sweeteners	Antioxidant	Fruity Flavor Added	Regular
21	Less Sugar	Without Health Benefits	Fruity Flavor Added	Affordable
22	Normal Sugar	Antioxidant	Original	Affordable
23	Less Sugar	Good for Gut Health	Fruity Flavor Added	Affordable
24	Less Sugar	Good for Gut Health	Original	Affordable
25	Normal Sugar	Good for Gut Health	Original	Regular
26	Normal Sugar	Without Health Benefits	Original	Regular
27	Sweeteners	Good for Gut Health	Fruity Flavor Added	Regular

The levels of kombucha attributes were determined based on several considerations revealed by the FGD results and literature review. The conjoint design included four product attributes, each with three levels. The kombucha attributes were as follows: (i) Flavors were identified as a critical attribute because of their significant impact on customer satisfaction and purchasing intentions [5, 7]. The preferences for flavor quality included original fermented tea and natural or artificial fruity flavors obtained from the FGD sessions; (ii) Sugar options were selected due to rising awareness of non-communicable diseases (NCDs), particularly diabetic diseases. Participants preferred sugar content claims when purchasing functional drinks to seek healthier options without sacrificing sweetness [4]. This preference indicates a desire for consumers to control body weight and manage blood glucose levels; (iii) Health benefits were suggested as an important attribute due to consumer demand to purchase products that offer functional advantages for preventive function and well-being [5]. Kombucha is recognized as a functional drink because it can enhance gut health benefits and provide antioxidants that support healthy lifestyles. Price was identified as a crucial factor influencing consumers' buying decisions and intentions. Price levels were determined based on the product's value proposition and categorized into affordable, regular, and premium options. Pricing levels suggest consumers' willingness to spend on kombucha in alignment with their perceived value benefits [5], [6]. A conjoint study questionnaire was created using Google Forms. The questionnaire was initially drafted in English and translated into Thai and Indonesian. To ensure linguistic accuracy and cultural appropriateness, the translations were reviewed by native speakers of each language. A back-translation procedure was subsequently performed, and any discrepancies were discussed and resolved collaboratively by the Thai and Indonesian native speakers. The questionnaire included sociodemographic information, consumption habits, and conjoint stimuli profiles, which consumers from Indonesia and Thailand then assessed.

2.2 Data collection of conjoint studies on the key kombucha attributes

A total of 241 respondents participated in the survey, comprising 138 Indonesians and 103 Thais. A consumer survey was conducted between August and November 2023. The target consumers were familiar with kombucha and had previously consumed it. Data was collected using non-systematic sampling at universities and densely populated public areas. In addition, the online survey was collected using various social media platforms (e.g., WhatsApp, LINE, Facebook, and Instagram), and social media influencers assisted in the survey. Screening questions were included at the beginning of the questionnaire to ensure that all participants had prior knowledge of kombucha. Only respondents who confirmed prior experience with kombucha were allowed to proceed with the survey. Participants completed the questionnaire in approximately 10-15 minutes. The data from conjoint studies included average relative importance, overall utilities, and individual part-worth utilities. The conjoint results were used to gain deeper insights into the most preferred attributes for developing kombucha products that align with the consumer segmentation in the specific market.

2.3 Determination of consumer segmentation and its simulated market models among Thais and Indonesians

The individual part-worth utility value from the conjoint study was used to segment consumers to gain in-depth insights into their socio-demographic characteristics and the most preferred kombucha attributes, following a previous method [5]. Consumer segmentation was conducted using Ward's hierarchical cluster analysis with Euclidean distance. Each segment was classified as a consumer according to its preference for specific kombucha attributes within the target market. Individual part-worth utilities were used to simulate market conditions based on product concepts obtained from conjoint analysis to assess the acceptability of a product concept in a specific market. Market simulations were performed using the market generator tools in the XLSTAT software [9]. Different kombucha attributes and their levels defined various product concepts, which were then analysed to create simulated market models and estimate potential market shares. The product concept with the highest market share value was identified as acceptable in the target market.

2.4 Statistical analysis

The data obtained from the conjoint analysis were analyzed using XLSTAT version 19.6 software (Addinsoft, New York, NY, USA). The average relative importance of each attribute and the individual part-worth utilities were analyzed based on the rating scores evaluated by consumers. The results were further analysed

using an Independent Samples T-test with SPSS statistics software version 22.0 (Thaisoftup Co., Ltd., Bangkok, Thailand) to assess the significance of mean differences between Indonesian and Thai respondents.

3. Results and Discussion

3.1 Consumer profiles and their sociodemographic characteristics between Thais and Indonesians

It was found that the sociodemographic profiles among all Indonesians and Thais revealed distinct consumer backgrounds. Indonesians were dominated by males (49.8%), while Thais were primarily females (72.4%). Thais were predominantly aged 15-24 (51.4%), whereas Indonesians were mainly aged 24-34 (52.7%). This age difference suggested that Thais, mostly university students, had lower incomes, while Indonesians generally had professional occupations with stable incomes. Both groups were well-educated, with 95.2% of Thais and 85.1% of Indonesians holding undergraduate or postgraduate degrees. Indonesians also consumed kombucha more frequently, with 22.9% consuming it several times a week, compared to 49.5% of Thais who consumed it less than once a month. This difference in consumption habits may correlate with product familiarity, with more frequent consumption linked to a better understanding of kombucha attributes. These findings align with Sulistyawati et al. [7], who highlighted the importance of sociodemographic characteristics in understanding consumer preferences.

Table 3. Sociodemographic profiles among respondents within each identified cluster for both nationalities

Sociodemographic Profiles	Thais			Indonesians		
	Price driven	Sweet-tooth cravers	Reduced sugar driven	Antioxidant Seekers	Healthier Options	Reduced sugar driven
Gender						
Male	27%	14%	27%	65%	52%	32%
Female	73%	86%	73%	35%	48%	68%
Age (years old)						
15-24	55%	71%	44%	32%	36%	32%
25-34	25%	29%	49%	42%	56%	62%
35-44	4%	-	5%	12%	4%	3%
45-54	12%	-	2%	12%	2%	3%
>54	4%	-	-	2%	2%	-
Income (THB)						
<15.000	49%	72%	38%	32%	43%	46%
15.000-24.000	25%	14%	31%	38%	37%	41%
25.000-34.000	12%	14%	20%	20%	18%	13%
35.000-44.000	4%	-	11%	4%	2%	-
>44.000	10%	-	-	6%	-	-
Education Levels						
Primary School	2%	-	-	-	-	-
Secondary School	6%	-	2%	14%	12%	11%
Bachelor's Degree	69%	71%	69%	54%	33%	59%
Bachelor's Degree	23%	29%	29%	32%	55%	30%

The sociodemographic backgrounds of each consumer segment between Thais and Indonesians were studied as shown in Table 3. The obtained individual part-worth utility values from the conjoint analysis provided detailed insights into the sociodemographic profiles of Thais and Indonesians within each consumer segment. Specifically, the three groups among Thais and Indonesians revealed different sociodemographic characteristics regarding gender, age, income, and education levels. This analysis evaluated the influence of consumer characteristics on the selection of kombucha attributes within each segment, which will be further discussed in the following study. This result suggested that understanding consumers' sociodemographic characteristics is crucial for identifying the key factors influencing their preferences, enabling entrepreneurs

to develop more effective market strategies. These findings agreed with previous studies that highlight the impact of sociodemographic factors on consumer preference and purchasing decisions among respondents in different countries [5, 6].

3.2 The consumer preferences on the most valued kombucha attributes for Thais and Indonesians

The cross-cultural study identified differences in preferred kombucha attributes between Thai and Indonesian consumers based on relative importance and utility values. The most preferred attributes were first determined at the general level for each country to evaluate the influence of nationality on kombucha preferences. A comprehensive analysis of these findings is presented in the following section.

3.2.1 The relative importance of kombucha attributes

This study revealed that the kombucha attributes' most relevant importance values differed for the two countries, as shown in Figure 1. The highest relative importance values indicate the significance of each attribute in affecting consumers' product choices [7]. Sugar options and price were the most important attributes influencing kombucha purchase decisions for Indonesian and Thai consumers. This aligns with previous research by Li et al. [4] and Ong et al. [10] highlighting the importance of sugar content and affordability in beverage choices. However, flavor and health benefits were less prioritized, consistent with the findings of Sulistyawati et al. [7] and Annunziata and Vecchio [11].

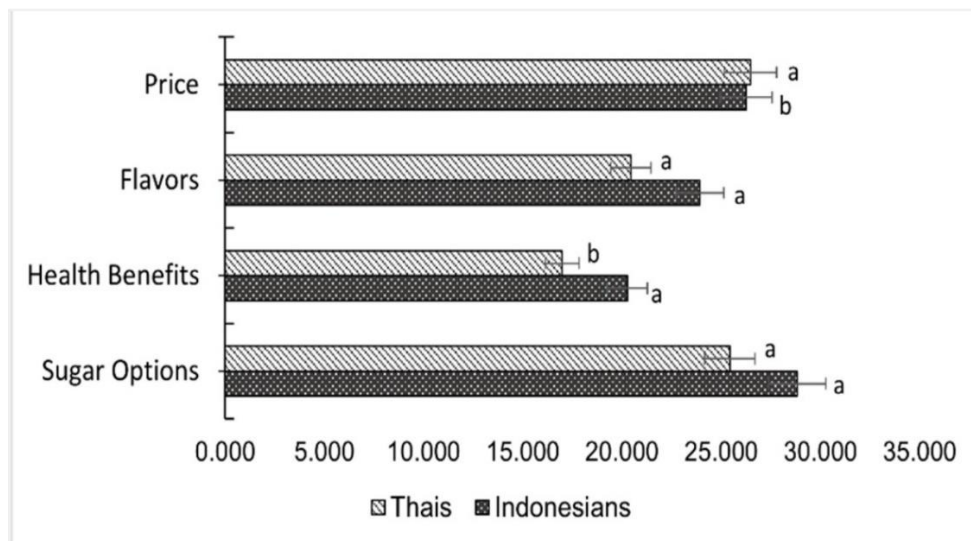


Figure 1. The average relative importance of kombucha attributes between Thais and Indonesians. Different letters exhibited significant differences in kombucha attributes between respondent groups ($P < 0.05$).

These findings suggested that when developing kombucha, it should be tailored to the most preferred product attributes across consumers in different countries related to sociodemographic and cultural background. Li et al. [4] reported that consumer background in specific market segments exhibited the preferences of sugar types as the key attribute in beverage choice, driven by the consumer demand for healthier options. The selection of sugar options in this study could be due to increasing consumer awareness of rising diabetes prevalence, as reported by the WHO [12]. Additionally, the prevalence of low to middle-income consumer profiles in both countries likely influenced the price preference as the most important attribute, as shown in Table 3. While flavors and health benefits were the least important attributes, they can be influenced by the perception of kombucha characteristics. This includes vinegary notes and harsh acidic taste, and its health claims have yet to affect their health or physiological functions significantly. Healthy products are often perceived as less acceptable to wider consumers, particularly due to the premium price with less appealing flavors [11]. These results suggested that kombucha products should balance sugar levels while offering competitive pricing to appeal to a broader consumer base. Moreover, reformulating flavors to address potential taste preferences and avoiding excessive health claims could enhance consumer acceptance [7, 11].

3.2.2 The overall utility values of kombucha attributes

The utility values for each kombucha attribute between Thais and Indonesians are shown in Table 4. Consumers in both countries strongly preferred reduced sugar content in kombucha, as indicated by the high positive utility values (Table 4), highlighting reduced sugar as a key attribute influencing consumer choice among health-conscious market segments. This result aligns with research by Li et al. [4] highlighting the importance of sugar reduction in beverages for seeking healthier options. A higher preference for "reduced sugar" claims may be influenced by the increasing prevalence of diabetes cases [12]. Although formulating low-sugar kombucha presents challenges, such as increased acidity and vinegary off-flavors, it remains a promising strategy to offer healthier options [3, 13]. Many commercial kombucha brands now feature "low sugar" claims to meet consumer demand [14], demonstrating that reduced-sugar formulations are feasible when using calorie-free natural ingredients, provided that sensory quality and consumer acceptance are carefully monitored [15-16]. Additionally, both groups disliked sweeteners, perceiving them as bitter and potentially harmful [15]. Despite that, Thais were more tolerant of sweeteners than Indonesians, suggesting a focus on calorie intake control [17]. The "normal sugar" attribute showed negative utility values among consumers in both countries. However, the negative value was lower for Indonesians. This could be due to Indonesians' preference for sweeter flavors, even while managing their sugar intake, and was consistent with previous studies [7, 10]. Hence, the sugar options in kombucha formulation should align with consumer preferences and target market segments to meet their needs effectively.

Table 4. The overall utility values on attributes and levels of kombucha between Indonesians and Thais.

Attributes of Kombucha	Levels of attributes	Indonesians		Thais	
		Mean	Std. deviation	Mean	Std. deviation
Sugar Options	Reduced Sugars	0.317*	0.503	0.164	0.424
	Normal Sugar	-0.013	0.393	-0.101	0.644
	Sweeteners	-0.304	0.495	-0.063	0.628
Health Benefits	Antioxidant	0.045	0.316	-0.054	0.355
	Good for Gut Health	0.030	0.324	0.124	0.316
	Without Health Benefits	-0.075	0.318	-0.069	0.358
Flavors	Fruity Flavor Added	-0.206	0.508	-0.104	0.438
	Natural Fruity Flavors	0.033	0.404	0.073	0.391
	Original	0.174	0.373	0.031	0.371
Price Levels	Affordable Price	0.040	0.463	0.215	0.507
	Premium Price	-0.122	0.635	-0.336	0.663
	Regular Price	0.082	0.419	0.120	0.418

* The bold style indicated the highest utility values as the most preferred attributes.

A significant difference in price level preference was found between consumers in both countries (Table 4). Thais, often university students with lower incomes, preferred affordable prices. This preference choice may be attributed to consumer profiles characterized by unstable incomes and product affordability benchmarks in the Thai market [10, 14]. This result was consistent with those in previous studies [10]. Meanwhile, Indonesians, with higher incomes, were more willing to pay regular prices for premium kombucha. This aligns with previous research showing income influences price level preferences [11]. Additionally, consumers in both countries exhibited less interest in "premium prices," as indicated by negative utility values (Table 4). Their unfamiliarity with kombucha's properties may have contributed to those attribute choices, as they perceived it as not worth the expense due to its less favorable taste and health benefits [5, 11]. Previous studies highlighted that consumer price preferences are affected by a product's value proposition and socio-demographic factors, particularly income [7, 11]. These findings indicated that price was the most important attribute to consumers in both countries, driving product choices and purchase decisions.

Flavor preferences also differed between Thais and Indonesians (Table 4). Indonesians favored traditional "original" flavors, while Thais preferred "natural fruity flavors". Cultural habits may influence these preferences, the intensity of consumption habits, and product availability benchmarks in the market [7, 11, 14]. In Indonesia, consumers prefer original traditional foods made through homemade processing, which may correlate with their preference for original flavors. This preference extends to kombucha, where traditional fermentation processes impart authentic fermented tea flavors [13, 18]. In contrast, Thais are drawn to 'natural fruity flavors' due to their familiarity with fruit characteristics and the availability of commercial kombucha products featuring fruity flavors in the Thai market [19]. Both groups showed less interest in "fruity flavors added," as indicated by negative utility values, reflecting a general aversion to artificial additives due to perceived health risks [17]. These findings suggested a consumer shift toward natural beverage ingredients, perceived as healthier options. However, it is crucial to acknowledge that incorporating natural ingredients may pose stability challenges, despite ongoing research efforts [13, 15]. Consumers in both countries valued health benefits (Table 4). Thais prioritized gut health benefits, likely due to the prevalence of fermented drinks and probiotic claims in their market [20-21]. Indonesians sought antioxidant benefits, reflecting their cultural familiarity with traditional antioxidant-rich drinks [22]. Both groups considered 'health benefits' a significant factor in their kombucha purchasing decisions. It was consistent with previous findings that the product was more acceptable when accompanied by preventive health-promoting effects [11]. Preferences for products with health benefits have influenced consumer choices over flavors, driven by awareness of the preventive effects of functional foods [22]. Annunziata and Vecchio [11] emphasized that respondents preferred food products with preventive health claims over those with generic or psychological claims in attaining consumer acceptance. While kombucha with specified health benefits attracted interest from Thais and Indonesians, health claims must adhere to local food regulations [11].

3.3 Consumer segmentation between Thais and Indonesians on valued kombucha attributes

Consumers in Indonesia and Thailand were clustered using hierarchical cluster analysis. It was revealed that the segmented consumer was divided into three clusters for each country. Although Indonesian and Thai consumers were grouped into "reduced sugar-driven" clusters, different clusters were found between Indonesian and Thai consumers to better understand market segmentation. The results were as follows:

3.3.1 Reduced sugar driven by segmented consumers

This cluster valued reduced sugar as the most crucial attribute in kombucha, showing the highest positive utility score for Indonesians and Thais as presented in Figure 2a and Figure 2b, respectively. Indonesians in this cluster preferred original flavors and were willing to pay a premium to gain gut health benefits. In contrast, while Thais assigned a lower utility score to reduced sugar, they still valued it alongside natural fruity flavors and prioritized affordable prices for similar health benefits. The preferences for kombucha attributes correlated with the sociodemographic profiles among Thais (n=45) and Indonesians (n=37), as indicated in Table 2. This cluster was dominated by well-educated females aged 25-34 across both countries. The high preference for reduced sugar in fermented kombucha is likely due to their awareness of the need to control sugar and calorie intake for weight management. This finding is consistent with previous studies [4], which indicate that reduced sugar is a highly valued attribute in functional products due to a health-conscious mindset. Consumers prioritize reduced sugar claims because of their significant association with dental health, obesity, diabetes, and weight management [23]. Higher education levels in this cluster may contribute to greater health awareness [11]. This cluster highlighted the importance of the reduced sugar claim in fermented kombucha, as consumers are aware of sugar intake limits and prioritize healthier lifestyle choices over flavor. Therefore, this group appealed to the health-conscious consumer segments in the Indonesia and Thailand markets.

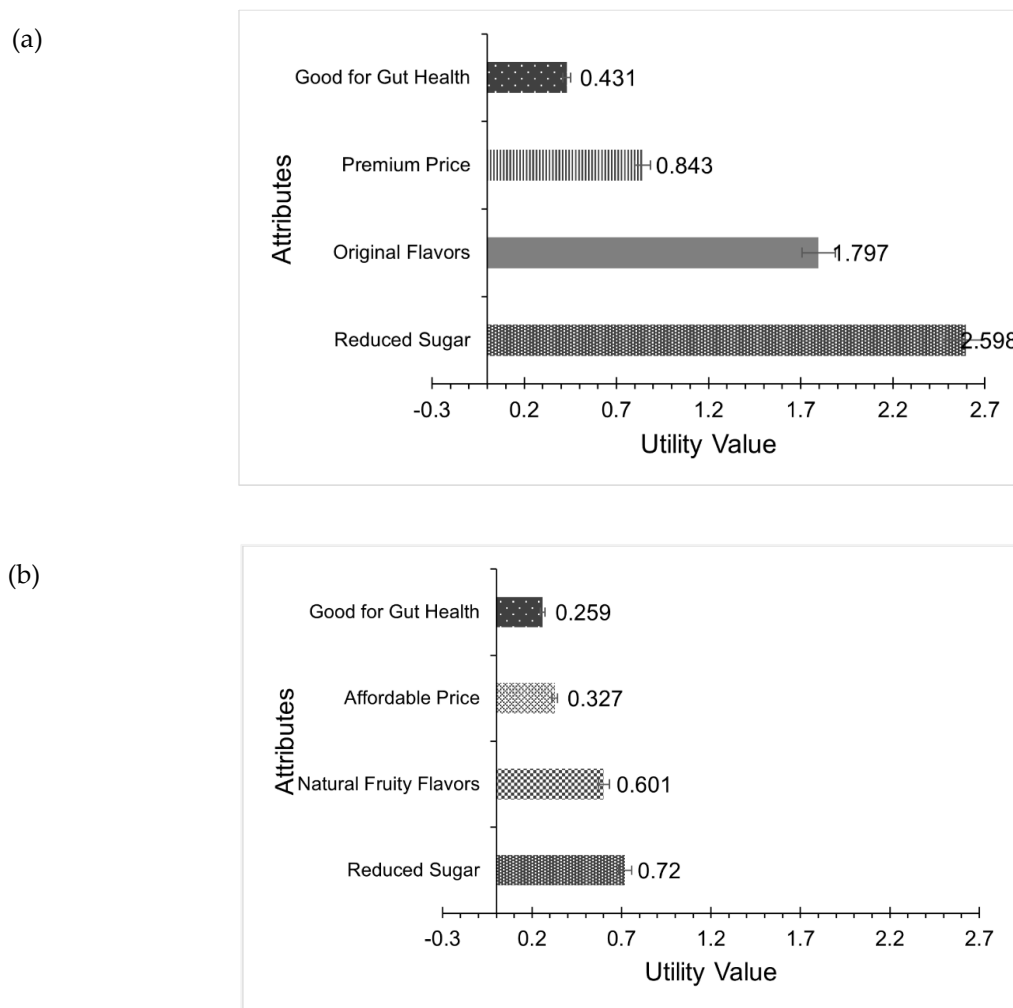


Figure 2. The preferences of “reduced sugar driven cluster” on kombucha attributes among both nationalities (a) Indonesians and (b) Thais.

3.3.2 Healthier options for segmented consumers

The healthier options segment was specific to Indonesian consumers (n=51) who prioritized reduced sugar and gut health benefits over affordable price and original flavor, as shown in Figure 3. These findings agreed with previous studies indicating that consumers favor attributes related to health benefits [5, 11]. This cluster was characterized by males as the dominant gender, with a productive age (25-34), and graduated with a bachelor's degree. Based on socio-demographic profiles, they preferred healthier option attributes when purchasing the product because of their awareness of the high prevalence of NCD cases associated with busy lifestyles and poor dietary habits [11-12]. In addition, consumers in this cluster highly preferred the original flavor of the fermented kombucha. This finding is consistent with the observations of Lee et al. [5], who reported that health-conscious consumers prefer the flavors obtained from natural ingredients over food additives. Despite this cluster being recognized as low-income consumers, they prioritized healthier option attributes over affordability due to the perceived health benefits of the kombucha.

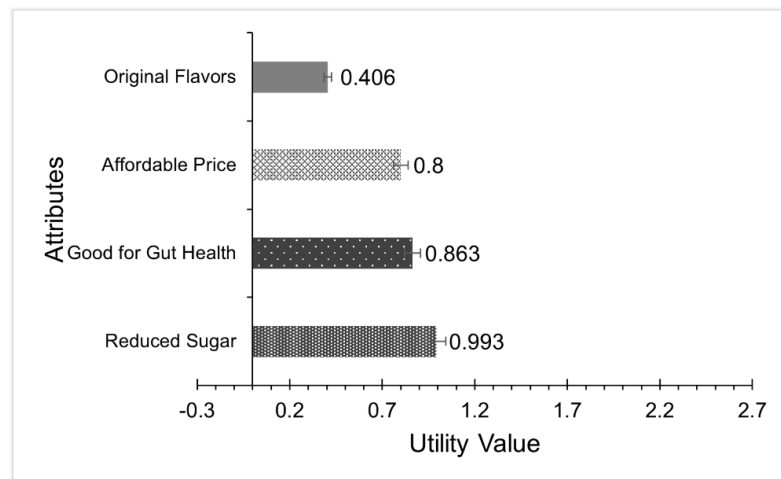


Figure 3. The preferences of the “healthier options cluster” on kombucha attributes among Indonesians.

3.3.3 Antioxidant seekers of segmented consumers

This cluster was also specific to Indonesian consumers (n=50), who prioritized antioxidant effects over affordable price, reduced sugar, and original flavors presented in kombucha, as shown in Figure 4.

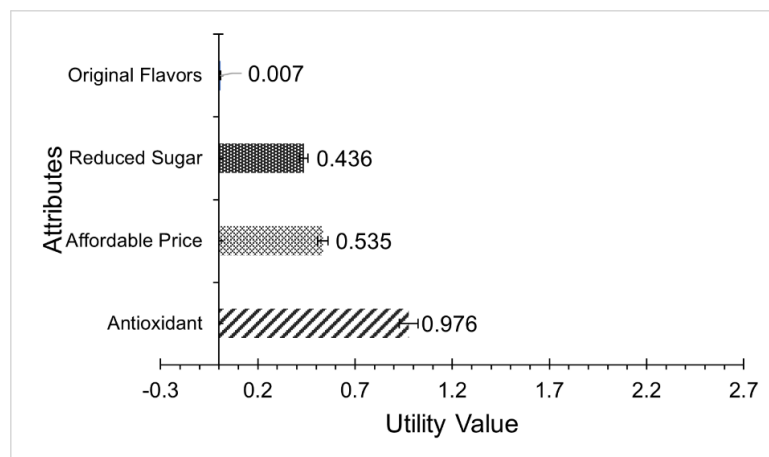


Figure 4. The preferences of the “antioxidant seekers cluster” on kombucha attributes among Indonesians.

The high preference for antioxidants could be due to the consumer perception that kombucha is made from tea substrates, which provide antioxidant benefits from polyphenols. This preference might also be influenced by Indonesian cultural habits of routinely drinking tea and other traditional drinks, “Jamu”, to maintain body endurance [22]. The socio-demographic background is associated with consumer profiles in this cluster. It was dominated by males, who were in their productive age, and might seek healthiness from an antioxidant-based fermented drink, otherwise known as kombucha. Despite having stable incomes, these consumers prioritized affordability while seeking health benefits. This is consistent with Silva et al. [24], who found that consumers favor functional drinks with antioxidant claims but still consider cost-effectiveness. These insights are valuable for product developers aiming to meet consumer preferences in segmented markets focused on antioxidant benefits.

3.3.4 Price-driven by consumers

The price-driven cluster was specific to Thais (n=51), who preferred to buy kombucha for affordability, as shown in Figure 5. This cluster was characterized by the kombucha attributes, with the addition of sweeteners with original flavors and without health benefits. The most preferred kombucha attributes represented their inclination towards lower-priced options.

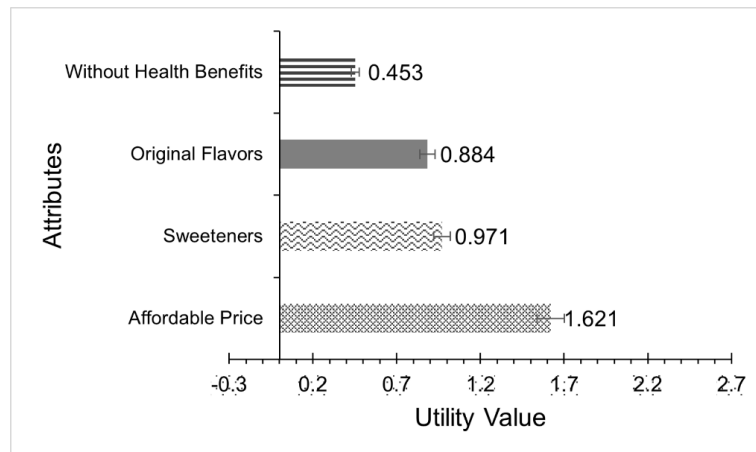


Figure 5. The preferences of “price-driven clusters” on kombucha attributes among Thais.

According to sociodemographic profiles, this cluster was recognized by females aged between 15 to 24 years and have low incomes without professional occupations. Indeed, the youngest women in this cluster preferred the kombucha attributes that indicate a preference for sweeter tastes and more robust flavors, managing their body weight, and choosing sweeteners with zero or low sugar content. However, there was also apprehension about sweeteners owing to the perceived health risks that can be obtained from the food additives [17]. Nevertheless, Fransisca et al. [25] suggested that consumers often view sweetener products as viable replacements for sucrose to reduce their sugar intake. These perceptions align with the study's findings, highlighting the importance of sweeteners in kombucha for controlling blood glucose spikes. Although this group preferred kombucha with sweeteners over health benefits, there is potential in this market segment, as affordability often precedes other attributes influencing consumer choice and purchase decisions.

3.3.5 Sweet-tooth cravers of segmented consumers

The sweet-tooth cravers cluster, specific to Thai consumers (n=7), showed a strong preference for craving sugary beverages, particularly favoring normal sugar present in kombucha. It was also found that they valued health benefits, choosing attributes suitable for gut health and original flavors, and they tended to buy at an affordable price, as shown in Figure 6. The high preference for normal sugar could be due to the dominance of females, with young generations (15-24) looking for sweet products to satisfy their desire to drink to enjoy appealing sweetness and tasty flavors [10, 26]. The preferences for normal sugar levels agreed with the findings revealed by recent studies [10, 23]. It was indicated that consumers prioritize sugar content as the most important attribute because they become habitual consumers of sweet-tooth products [10]. Although consumers opt to consume beverages with normal sugar levels, it is important to pay attention to the maximum limit of sugar in daily consumption [25]. This cluster also looked for gut health benefits, as indicated by the positive utility values in this study, and was consistent with the findings by Annunziata and Vecchio [11]. Consequently, it was suggested that a new product design should pay attention to the most preferred attribute in line with the sociodemographic characteristics of the segmented consumer in the intended market.

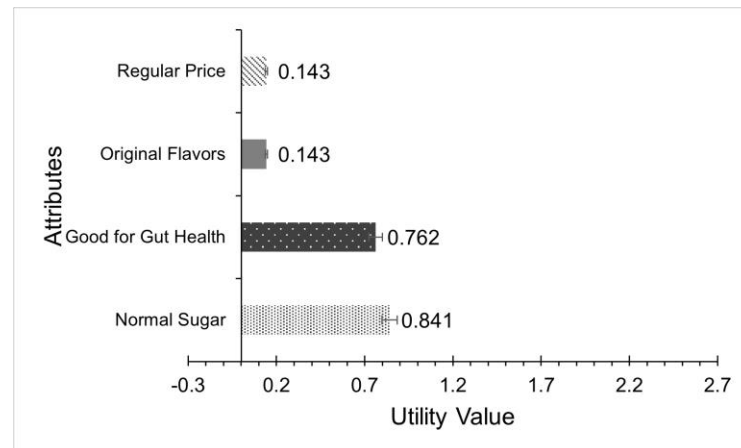


Figure 6. The preferences of “sweet-tooth cravers clusters” on kombucha attributes among Thais.

As a result, the segmented consumers in both countries have different preferences for kombucha attributes. Indonesian consumers opted for kombucha, which has health benefits, notably reduced sugar, consistent with overall utility values (Table 2). Thai consumers consistently prioritized affordable prices across all clusters, and their preference was aligned with the overall utility values among Thais. Thus, understanding these consumer segments is crucial for product developers to create functional beverages that align with the specific segmented consumers and market.

3.4 Simulated market models for product concepts that are acceptable for Thais and Indonesians

The obtained product concepts from the overall utility values and individual part-worth utility values between Indonesian and Thai consumers were analyzed. The selected product concepts for the Indonesian market are shown in Table 5, whereas those for the Thai market are presented in Table 6. Consumers in both countries showed different preferences owing to their diverse cultural backgrounds and behaviors [27].

Table 5. Market simulation for product concepts of kombucha attributes among Indonesian consumers.

Indonesian Consumer Cluster	Light	Health Benefits	Flavors	Price	Total Market Share
General Indonesian	Reduced Sugar	Antioxidant	Original	Regular Price (IDR 20.000-40.000)	23.207
Antioxidant Seekers	Reduced Sugar	Antioxidant	Original	Affordable Price (IDR <20.000)	25.464
Healthier Options	Reduced Sugar	Good for Gut Health	Original	Affordable Price (IDR <20.000)	25.422
Reduced Sugar Driven	Reduced Sugar	Good for Gut Health	Original	Premium Price (> IDR 40.000)	25.908*

* The bold style indicated the highest total market share value as the most acceptable product concept for kombucha development.

It was found that the product concepts for Indonesians from each segmented consumer were well-received in the simulated market (Table 5). Specifically, the “reduced sugar driven” consumer segment demonstrated the highest total market share, indicating strong consumer willingness to purchase and in alignment with the sociodemographic background in those clusters [28]. This strong value proposition also explains the acceptance of premium pricing among these consumers, particularly for the health-consciousness market segment. Moreover, an affordable price with a preference for kombucha attributes that prioritize reduced sugar, original taste, and health benefits is also in high demand, representing the second-largest market share. The market share value is differentiated based on consumer interest in the levels of antioxidant attributes and gut health benefits. Above all, Indonesians were looking for kombucha attributes to gain health

benefits with “original flavors”, and they were willing to spend money based on the value of the key attributes. This implies that a product concept with a larger total market share can fulfill consumer needs and fit a specific target market. Ong et al. [6] emphasized these findings; it was revealed that the data of the conjoint studies can further determine the market segmentation while providing insights for novel products and catering to customer satisfaction [29].

Table 6. Market simulation for product concepts of kombucha attributes among Thai consumers.

Thai Consumer Cluster	Sugar Options	Health Benefits	Flavors	Price	Total Market Share
Price Driven	Sweeteners	Without Health Benefits	Original	Affordable Price (THB 15-24)	35.142
Sweet-Tooth Cravers	Normal Sugar	Good for Gut Health	Original	Regular Price (THB 25-50)	28.670
Thai General consumers or Reduced Sugar Driven	Reduced Sugar	Good for Gut Health	Natural Fruity Flavors	Affordable Price (THB 15-24)	36.188*

* The bold style indicated the highest total market share value as the most acceptable product concept for kombucha development.

In the Thai market, the most acceptable product concept was obtained from the overall utility values of Thai general consumers and the segmented consumers for “reduced sugar driven”. The “reduced sugar” and “natural fruity flavors” attributes were identified as key factors driving Thai consumers to purchase kombucha intensely (Table 6). Interestingly, the product concept from the “price-driven” consumer segment was more interesting to consumers and suggested market opportunities for the Thai market, even if it contained “sweeteners” and “without health benefits”. These findings emphasized the importance of understanding consumer profiles in specific market segments. Some consumers are motivated to buy kombucha not for its health benefits but for its affordability [30]. Lower-income consumers influenced the consumer preference to buy products for affordability due to financial constraints [6, 31]. As a result, the simulated market model and its consumer behavior guide product developers when launching new food products to ensure competitiveness and feasibility in crowded markets [32].

4. Conclusions

Consumers from Thailand and Indonesia preferred a reduced sugar kombucha. Indonesian consumers were willing to pay a regular price for kombucha, which is characterized by original flavors and provides antioxidant benefits. Meanwhile, Thai consumers sought more affordable price options and preferred kombucha with natural fruity flavors that could improve gut health. Consumer preferences on kombucha attributes were influenced by sociodemographic profile, cultural background, healthier choice lifestyle, and familiarity with kombucha attributes. When targeting the consumers, the “reduced sugar-driven segment” was indicated to have more market opportunities because it showed the highest total market share values in simulated market models across Thailand and Indonesian markets. Furthermore, the consumer segment indicated that Thais were driven by “affordability”, while Indonesians were willing to purchase kombucha because they sought the health benefits and authentic fermented flavors. These findings revealed the consumer needs in the specific targeted market, which will help develop a “new functional kombucha” and other beverages.

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