

Exploring the product attributes of butterscotch sauce made from palm syrup by Kano model



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Abstract This study revealed key insight into the consumption behavior and product attributes of sauces, specifically regarding butterscotch sauce made from palm syrup, using the Kano model. The sample consisted of 409 participants who responded to a questionnaire, and data were collected through frequency, percentage, mean, and customer satisfaction coefficient. Most participants purchase sauces on a regular basis, with a significant portion using sweet sauces for desserts and beverages, though awareness of butterscotch sauce is mixed. However, there is strong consumer interest in butterscotch sauce products, particularly when packaged in 180-ml plastic squeeze tubes, priced between 101 and 200 Thai baht, and featuring modern design elements. Consumers also value the use of local ingredients and express a high willingness to purchase such products, especially if they include usage guidelines. The study also identified various product attributes of butterscotch sauce made from palm syrup, categorized into indifferent, satisfying, attractive, and reverse attributes based on their impact on consumer satisfaction. Seven indifferent attributes were found, which neither enhance nor detract from consumer satisfaction. These include modern packaging and availability in supermarkets and souvenir shops. Three satisfying attributes were highlighted, such as the completeness of label details and appropriate pricing for quality, which positively influence consumer satisfaction. Attractive attributes, like the brown sugar aroma and the availability of recipes, were identified as key factors that uniquely engage consumers and drive demand. However, the study also revealed two reverse attributes—thick consistency and excessive sweetness—that cause dissatisfaction and require improvement. The satisfaction and dissatisfaction coefficients further emphasize the importance of providing recipes and methods of use while addressing concerns about price and label completeness to enhance overall consumer satisfaction. These findings provide valuable insights for developing palm syrup-based products that cater to consumer preferences.

Keywords: butterscotch sauce, palm syrup, product attributes, kano model

1. Introduction

In 2021, Phetchaburi Province was recognized as a member of the Creative Cities Network as a City of Gastronomy by UNESCO (Tansuchat & Plaiphum, 2023). The impact of being designated a creative cities network caused the province to be developed according to the criteria set by UNESCO, which cover all four dimensions: society, culture, the economy, and the environment (Xiaomin, 2017). In addition, it must promote its distinctive identity as a City of 3 Flavors: the sweet taste of palm sugar, the salty taste of sea salt, and the sourness of the lemon in the daily lives of Thai people and tourists (Mungsri, 2022). Toward becoming a city that creates businesses or creative industries and includes exchanging knowledge and experiences between cities, which leads to sustainable city development (Itthakamhaeng, 2022).

In Phetchaburi Province, the palm tree is an important economic crop for sugar production. Currently, people use sugar from palm trees for food and beverages, including fresh palm juice, vinegar, and palm sugar (Aroonsrimorakot et al., 2020). However, an interview with the president of community tourism enterprises revealed the challenges associated with sugar production and the potential for using palm sugar as a tourism product in Phetchaburi Province. One of the issues with palm sugar production is that it requires a significant amount of time and energy to produce palmyra, a sugar made from fresh palm juice that is simmered until the water evaporates, resulting in a thick and crystallized texture. However, the yield per batch is relatively small. As a result, many sugar producers currently do not produce palmyra. Furthermore, the issue arises from the desire of young tourists for souvenir products made from palm sugar that are distinct from those previously available. Moreover, the product can be conveniently paired with a variety of sweets and beverages but still retains the uniqueness of palm sugar. Because of the long processing time, manufacturers have switched to producing syrup from palm sugar. However, if we use syrup made from palm sugar in a new product, it will allow sugar producers to save time and be a good choice for tourists (Nagasuk, 2023).



Using the Kano model is important for entrepreneurs who want to develop agricultural products to reduce experimentation time and obtain results that are consistent with the characteristics that consumers need, resulting in satisfaction with the new product (Huang et al., 2020). Service users' perceptions of the developed service characteristics (Chen et al., 2018). The Kano model has been used to develop a company's food products and analyze the needs of customers who use services to develop bakery products (Wimarnaya et al., 2021). Djekic et al. (2020) also studied the characteristics of the sensory and chewing times of confectionery products. In the context of Thailand, Sangayotin et al. (2021) studied the trends and packaging design for oyster sauce, which helped identify the main product attributes that consumers value, such as taste, value of the product, and marketing strategies.

On the basis of the needs and problems mentioned above, the researcher instead created food products to support community tourism via local ingredients. We were interested in applying the Kano model, which has the advantages of reducing the duration of the experiment and producing results that are consistent with consumer needs (Huang et al., 2020). This research aimed to study the consumption behavior of sauces and butterscotch sauce and to determine the appropriate product attributes of butterscotch sauce made from palm sugar syrup via the Kano model. The results can be used as a guideline for developing prototype products that reflect the unique sweet taste and aroma, can be stored for a long time, can serve many types of desserts and drinks, and can be used as a souvenir for local tourist attractions in the future.

2. Materials and methods

2.1. The population and sample

The population and sample are sauce consumers. WG Cochran's unknown sample size formula, at a confidence level of 95 percent (Wanitchbancha, 2016), calculates a sample size of at least 384 people, selecting the sample on the basis of a convenience selection technique with sauce consumers who are willing to answer the questionnaire. The general public responded by consuming 413 sets of sauces, and upon verifying the completeness of the questionnaires, 409 sets remained, representing 99.03% of the total number of completed questionnaires.

2.2. Research tools

The research tools used in this study were quantitative in nature. The study employed a questionnaire that comprised four components: consumer information, consumer behavior analysis, Kano model-based consumer satisfaction product attribute analysis, and modifications of Jaipan & Potchanasin (2016). The questions consisted of positive questions or functional questions, negative questions, and a hypothetical situation in which a butterscotch sauce product was made from palm sugar syrup. As described in Table 1 the process of assessing the quality of research instruments involves assessing the dependability of the questionnaire through the assessment of three specialists in the fields of food product development, food and nutrition, and local food. By subsequently analyzing the reliability of the questionnaire on the basis of the item objective congruence index, we discovered a total mean of 0.91 for the entire questionnaire among those who were similar to the sample size of 30 people. The study revealed that the tryout questionnaire had a Cronbach's alpha coefficient equal to 0.89, with the resulting alpha coefficient not being less than 0.6 (Silcharu, 2012), indicating its confidence. Data collection was performed with convenience sampling by distributing questionnaires at Bangkok and Phetchaburi Province tourist attractions and through an online system related to sauce consumers. This research used the data collection period from March to June 2023.

2.3. Data analysis

Data analysis of the information of respondents, consisting of frequency, percentage, and analysis of appropriate characteristics of butterch sauce products from palm sugar syrup via the Kano model, involves the following analytical steps (Berger et al., 1993; Materla et al., 2019): 1) The responses obtained from the Kano model questionnaire, which are positive and negative questions, are used, and the results for each item are compared with those of the Kano model comparison table (Table 1 and 2) Utilize the data from step 1 to evaluate all needs, employing frequency and percentage methods. 3) Utilize the data from step 2 to compute the satisfaction coefficient, which determines the degree of consumer satisfaction (better value) and the degree of consumer dissatisfaction (worse value). The average level of consumer satisfaction is calculated as follows:

- Satisfaction Value (Better Value) = $(A+O)/(A+O+M+I)$
- Dissatisfaction value (Worse Value) = $(O+M)/((A+O+M+I) \times (-1))$

However, the interpretation of the results is based on the satisfaction value, which has a value between 0 and 1. Therefore, when the result number is close to 1, there is high consumer satisfaction. If the result is close to -1, the consumer is not satisfied.

3. Results

3.1. Results of the study of the consumption behavior of sauce and butterscotch sauce.

3.1.1. According to the results of the sauce consumer information survey

64.80 percent of the respondents were female, 32.30 percent were male, and 2.90 percent did not want to be specified. There are 3–4 family members, 57.90 percent, followed by 5–6 people, 23.00 percent.

3.1.2. This study analyzed the consumption behavior of sauces

The results of the analysis of consumer behavior towards to the butterscotch sauce were shown in Table 2. A total of 70.20% of the participants in the sample group had purchased sauces for cooking desserts and drinks in the past 2 weeks. Most consumers habitually purchase sauces. A total of 69.90% of the samples reported using sweet sauces in their cooking for desserts and beverages, typically 1–2 times per week. Obviously, 46.70 percent of consumers do not know about butterscotch sauce products, 52.60 percent do. However, 57.50 percent of consumers purchase sweet sauce for individual consumption, whereas 23.12 percent do so because of its taste.

Table 1 Tabulation of the Kano model.

Customer Requirements		Dissatisfaction (Negative question)				
		like	must be	neutral	live with	dislike
Functional (Positive question)	like	Q	A	A	A	O
	must be	R	I	I	I	M
	neutral	R	I	I	I	M
	live with	R	I	I	I	M
	dislike	R	R	R	R	Q

Source: Berger et al. (1993); Jaipan & Potchanasin (2016).
 Note: A (attractive) means that the product attribute duty attracts customers; O (one-dimensional) means that the product attribute that makes consumers satisfied; M (must-be) means that the product attribute that is required for the product; R (reverse) means that the product attribute is not needed and should improve; Q (questionable) is that this duty needs to be realized because it is in the area of dissatisfaction; and I (indifferent) is that this duty is not different in the feelings of consumers.

Table 2 Percentages of consumption behavior of sauces (n=409).

Personal information	Percent
Sauces purchasing behavior in the past 2 weeks	
Purchased	70.20
Non purchased	29.80
Using sweet sauces in cooking, desserts and beverages	
Never	14.20
Sometimes	69.90
Quite often	7.60
Regularly	8.30
Familiar butterscotch sauce	
Familiar	47.40
Non familiar	52.60
Purchasing sweet sauce behavior	
Purchased	57.50
Non purchased	42.50
Reasons for choosing to buy sauce for eating	
Can choose the brand by themself	14.35
Personal preference	20.71
Pricing	13.19
Personal information	
Taste	23.12
Can be used to cook for food, desserts, and drinks	17.35
Product standards	9.54
Never bought	1.74

3.1.3. Hypothetical results indicate that consumers are interested in butterscotch sauce products made from palm syrup

A total of 89.20 percent of consumers expressed interest in 180 milliliters of plastic squeeze tube packaging, while 41.81 percent were satisfied with the price range of 101–200 Thai baht. Additionally, 54.80 percent expressed satisfaction with the modern logo and product design, and 24.66 percent expressed interest in the use of local ingredients. Finally, 97.30 percent expressed interest in purchasing products if they were available for sale, but they requested the inclusion of usage guidelines.

3.2. Results of the analysis of the appropriate characteristics of butterscotch sauce from palm syrup via the Kano model



On the basis of the Kano model analysis, the respondents' percentage ratios for each product attribute are as follows: 1) Attractive (A) 2) One-dimensional (O) 3) Must-be (M) 4) Indifferent (I) 5) Reverse (R) and 6) Questionable (Q) can display product attribute classification in Table 3.

Table 3 Percentages of the Kano model.

Product attributes	A	O	M	I	R	Q	total	Classification
The packaging is modern	26.52	3.89	9.00	54.26	2.68	3.65	100	I
Show complete details on the label	16.30	30.90	26.76	20.68	2.19	3.17	100	O
Butterscotch sauce has dark brown	7.79	1.46	0.49	76.64	9.49	4.13	100	I
Butterscotch sauce has odorous of sugar brown	45.50	10.22	22.87	19.22	0.73	1.46	100	A
Butterscotch sauce has a thick consistency	20.68	0.24	2.19	35.28	39.17	2.44	100	R
Butterscotch sauce has a sweet taste	10.46	0.73	4.62	34.56	45.01	4.62	100	R
The price of the sauce is appropriate for the quality	13.14	33.09	26.03	23.11	2.19	2.44	100	O
Butterscotch sauce is selling for the same price as before	47.93	3.41	4.62	43.80	0.24	0.00	100	A
The sauce has a higher price than the market but the quantity is larger	7.54	2.92	10.95	67.15	6.08	5.36	100	I
Butterscotch sauce can be purchased at most supermarkets	39.66	6.08	4.14	49.64	0.48	0.00	100	I
The sauce is available at local souvenir shops	4.38	0.24	0.49	59.85	24.33	10.71	100	I
The seller can suggest other uses	20.92	31.39	18.73	24.09	4.14	0.73	100	O
The sauce is unique and there is a souvenir promotion	27.98	4.38	8.03	51.09	7.79	0.73	100	I
There is publicity on how to use the sauce into other menu	24.33	12.65	13.63	42.82	5.11	1.46	100	I
There is a recipe or method of use that can be followed	38.93	17.27	9.98	26.03	6.08	1.71	100	A

Note: The meanings of the symbols are shown in Table 1.

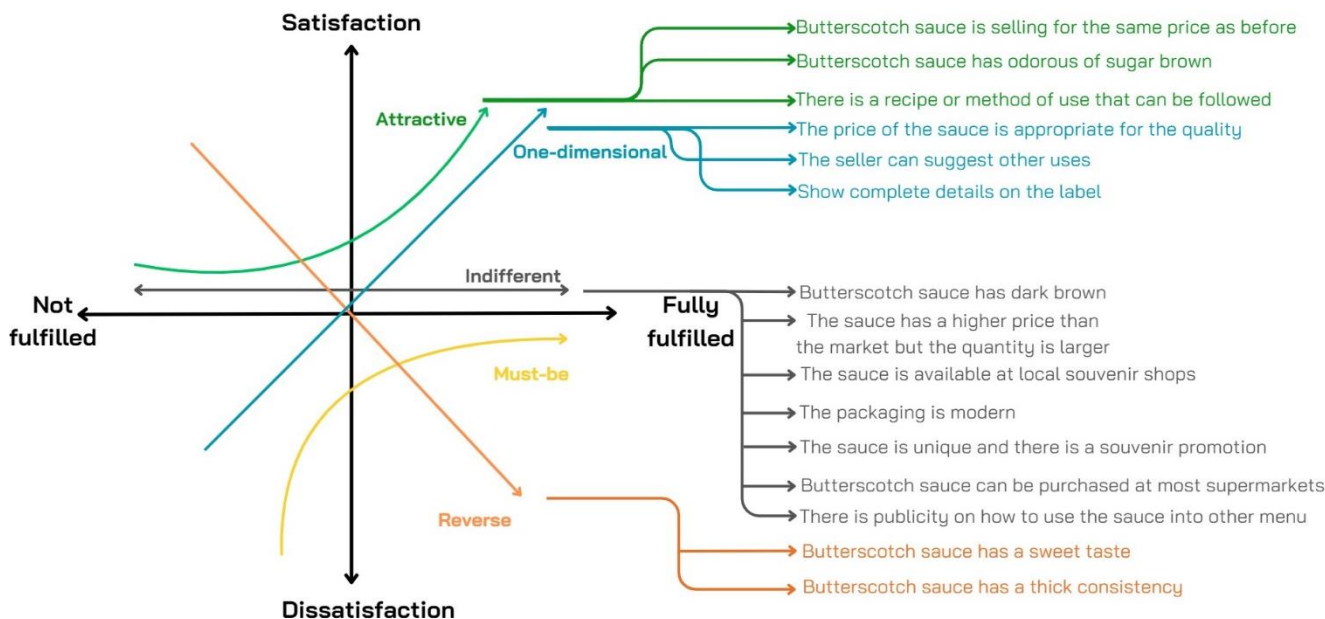


Figure 1 Kano's model of butterscotch sauce attributes on customer satisfaction.

The results in Table 3 and Figure 1 reveal seven indifferent (I) product attributes of butterscotch sauce made from palm syrup, followed by three satisfying (O) product attributes, three special (A) attractive product attributes, and two unsatisfactory (R) characteristics. However, the following can be explained:

Indifferent (I) is an attribute that does not affect the consumer's feelings, does not leave an impression, and does not cause dissatisfaction. There are 7 characteristics: 1) the packaging is modern. 2) The butterscotch sauce is dark brown. 3) Sauces have a higher price than the market does, but the quantity is greater. 4) Butterscotch sauce can be purchased at most supermarkets. 5) S sauce is available at local souvenir shops. 6) The sauce is unique, and there is a souvenir promotion; and 7) there is publicity on how to use the sauce on other menus.

One-dimensional (O) is a feature that increases consumer satisfaction with the product, prompting them to request additional features to enhance their satisfaction even further. The study identified three key product attributes: 1) Complete details on the label. 2) The price of the sauce is appropriate for quality, and 3) the seller can suggest other uses.

Attractive (A) is a special attribute that attracts and keeps consumers interested and satisfied. This feature will drive demand for butterscotch sauce products made from palm syrup, offering consumers a unique experience that sets them apart from other products. Three product attributes were identified: 1) Butterscotch sauce has a sugar brown odor. 2) butterscotch sauce is sold at the same price as before, and 3) there is a recipe or method of use that can be followed.



The reverse (R) is an attribute that consumers do not want and should improve, causing dissatisfaction with the product. Two product attributes were identified: 1) butterscotch sauce has a thick consistency, and 2) butterscotch sauce has a sweet taste. The must-be (M) is a necessary and important attributes in sauce. If this attribute is missing, the sauce will be dissatisfied. The Figure 1 showed that there is no attribute that effect consumer satisfaction in this section. It is probably due to the respondents already know the good attributes of this sauce.

The results of the coefficient of satisfaction and dissatisfaction were determined by the frequency values of the MOA and I product attributes (shown in Table 4). The three most important product attributes that make consumers satisfied are as follows: there is a recipe or method of use that can be followed (0.60), followed by butterscotch sauce having an odor of sugar brown (0.57), and the seller can suggest other uses (0.54). The product attributes that cause consumers to feel dissatisfied include the following: the price of the sauce is not appropriate for quality (-0.62), followed by incomplete details on the label (-0.61), and the seller cannot suggest other uses (-0.51).

Table 4 Satisfaction and dissatisfaction coefficients.

Product attributes	Satisfaction value (A+O)/(A+O+M+I)	Dissatisfaction value (O+M)/((A+O+M+I)x(-1))
The packaging is modern	0.32	-0.14
Show complete details on the label	0.50	-0.61
Butterscotch sauce has dark brown	0.11	-0.02
Butterscotch sauce has odorous of sugar brown	0.57	-0.34
Butterscotch sauce has a thick consistency	0.36	-0.04
Butterscotch sauce has a sweet taste	0.22	-0.11
The price of the sauce is appropriate for the quality	0.48	-0.62
Butterscotch sauce is selling for the same price as before	0.51	-0.08
The sauce has a higher price than the market but the quantity is larger	0.12	-0.16
Butterscotch sauce can be purchased at most supermarkets	0.46	-0.10
The sauce is available at local souvenir shops	0.07	-0.01
The seller can suggest other uses	0.54	-0.51
The sauce is unique and there is a souvenir promotion	0.35	-0.14
There is publicity on how to use the sauce into other menu	0.40	-0.28
There is a recipe or method of use that can be followed	0.60	-0.30

Note: When the results are close to 1, there is high consumer satisfaction; if the result is close to -1, the consumer is dissatisfied with the product attributes.

4. Discussion

4.1. According to the findings on consumption behavior

There is a higher frequency of purchases of sauces for cooking, desserts, and drinks than of nonpurchases, occurring approximately 1–2 times per week. Taste and personal preference are the primary reasons for purchasing these sauces. This could be because the food service industry often pairs butterscotch sauce with sweet foods or drinks. Today, consumers exhibit more health-conscious behaviors as a result of Konar et al. (2022). Compared with savory foods, Generation Y consumers' decision to purchase healthy ginkgo biloba dessert products is consistent with their less frequent consumption of sweets. Wiketkit et al. (2022) noted that consumers typically consume sweets 1–2 times per week because of their emphasis on health and wellness. Walidayni & Chaldun (2020) also indicated that consumers in Indonesia between the ages of 18 and 55 have purchasing intentions for dessert products that are increasing when they know that the products have health attributes. Moreover, a study revealed that a brand's attributes are modern, easy to remember, and representative of the ingredients. This could be due to the logo's long-term use of the product. A logo that is modern and uses expressive colors will be easily accessible to consumers. Opanont (2021) showed that the principles of logo design consist of 1) changing the long symbol to a special and short symbol, 2) using distinctive characters to convey fun and enjoyment, 3) using familiar images, and 4) creating strange geometric shapes.

4.2. The results of this study indicate that butterscotch sauce products made from palm syrup possess appropriate product attributes

The study classified most product attributes as indifferent (I), implying that consumers perceive no differences in terms of products, prices, distribution channels, or marketing promotions. The development of the questionnaire for this study may have relied heavily on the concept of marketing strategy. According to Nuseir and Madanat (2015), general entrepreneurs utilize this strategy as a fundamental approach for marketing planning, aiming to satisfy consumers. However, excessive usage may lead to consumers becoming accustomed to it, leading them to believe that certain product features are insignificant. This finding aligns with the finding of Phromprasit (2018), which categorize nearly all packaging characteristics of ready-to-drink coconut water products as identical, rather than distinct, owing to their standard design.



Attractive (A) product attributes can leave a lasting impression on consumers, such as the sugary brown aroma of butterscotch sauce, its consistent price, and the availability of a recipe and other use methods. This may be due to the way in which consumers make decisions about quality and consider the product's versatility (Samithikrai, 2019). In addition, consumers are also interested in food products that are both traditional and versatile (Seufert et al., 2017).

One-dimensional (O) product attributes, when added to a product, can increase consumer satisfaction. However, if this type of feature is absent, consumers may become dissatisfied, as the sauce must be fully detailed on the label. This could be because a comprehensive label enhances a product's reliability and facilitates easier purchasing decisions. A study by Ikonen et al. (2020) noted that labeling on the front of food packaging (FOP), which consists of nutritional information and the benefits of food, can make consumers who are not health conscious aware of the advantages of the product and be able to change their behavior, purchase intentions, and consumption.

However, sauce products, which should not have a thick consistency, be easy to spread, blend well with other ingredients, and have a slightly sweet taste, are examples of reverse (R) product attributes that need improvement to satisfy consumers. This may be because consumers are familiar with sauce products sold in general. Therefore, developing a new sauce product requires it to have a comparable viscosity. In addition, the trend toward reduced-sweetened foods has played a greater role for consumers. This finding is consistent with the findings of the Thai Health Promotion Foundation (2023) that consumers in Bangkok, Thailand, currently eat approximately 60% of unsweetened beverages. This is because they are concerned about the future occurrence of chronic diseases. This finding is also in line with Yuenyong (2021), who noted that in the business plan for healthy fresh sugar drinks, consumer behavior is more interested in healthy food and prefers to consume beverages with a less sweet taste or sugar substitutes.

5. Conclusions

This study aims to broaden our understanding of local food product development through the utilization of the KANO model, which is beneficial to the food industry because it shortens the time required to plan product specifications in line with actual consumer needs. By studying the product attributes of butterscotch sauce made from palm syrup, it has emerged as a new product. The findings highlight the needs of consumers, which can guide the development of guidelines for prototype products. These guidelines aim to increase the value of palm syrup and create opportunities for its use as a souvenir product for tourism in Phetchaburi Province in the future. The following section is divided into three distinct areas:

The first aspect, attractiveness, refers to features that can capture consumers, surpass their expectations, leave a lasting impression, and garner their acceptance through unique features. Entrepreneurs should design products to cater to the following needs: Butterscotch sauce should have a brown sugar flavor. The selling price is the same as before, and a recipe or method of use can be followed.

The second aspect, known as one-dimensional, refers to the product attributes that contribute to consumers' satisfaction with the product. Entrepreneurs should design products with comprehensive label information. The price is appropriate for quality, and the seller can recommend using it. and can be used with sweet food or other types of drinks.

The third aspect, in contrast, highlights the product attributes that dissatisfy consumers and warrant improvement, such as the viscous consistency and excessive sweetness of butterscotch sauce. As a result, entrepreneurs should avoid making butterscotch sauce products from palm syrup because they have a slightly sweet taste. The liquid texture allows easy wiping or mixing with other ingredients.

Acknowledgment

This research was conducted as part of the development of butterscotch sauce products from palm syrup as a food tourism product for a tourism enterprise by the Ban Rai Sathon community in Tham Rong, Phetchaburi Province, Thailand. The researcher would like to thank you TRM (Talent Resource Management Platform), the president of community tourism enterprises of the Ban Rai Sathon community in Tham Rong and Rajamangala University of Technology Phra Nakhon.

Ethical considerations

We confirm that we have correctly followed the ethical policies for this study, which includes human subjects, in addition to confirming the consent of all the respondents involved.

Conflict of interest

The authors declare that they have no conflicts of interest.

Funding

This research was supported by the TRM (Talent Resource Management Platform).

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