

Food safety of Thai tea sold through an online platform application in Indonesia

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Abstract

Thai tea is one of the beverage products that are often ordered by Generation Z through online applications. With the rise of Thai tea drinks in the market, it is suspected that some individuals cheat

by adding cyclamate to Thai tea drinks when concocting them to get a good taste and sweetness at a low price. This study aimed to examine the correlation between the level of knowledge and the attitudes of traders regarding the use of cyclamate food additives in Thai tea processed drinks, which are sold through online application-based food delivery services in the Surabaya and Sidoarjo regions. This research was an observational analysis and had a cross-sectional design. The study sample of 46 Thai tea beverage products was taken by simple random sampling. Research shows that there is no link between knowledge ($p=0.654$), attitudes ($p=0.950$), and behavior ($p=0.849$) with the use of cyclamate in Thai tea beverage products. The conclusion of this study is the absence of any connections between knowledge, attitude, behavior, and the use of cyclamates. The results classify Thai tea products, both qualitatively and quantitatively, as safe. Based on questionnaires, respondents had good knowledge, but they also had negative attitudes and behaviors.

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Introduction

The COVID-19 pandemic has led Indonesians to increasingly rely on online food delivery services due to policies limiting their ability to dine in at restaurants. Data from Moka, an Indonesian startup specializing in digital cashier services, shows that food and beverage purchases through online delivery methods increased by 7% from January to February 2020 (Candra *et al.*, 2021). Based on a 2019 survey of respondents aged 18-45 years on the Berry Kitchen, Go-Food, Grab Food, and Culinary apps, 58% of Indonesians choose to buy food through online applications. GrabFood and GoFood have become the dominant solutions for Indonesian consumers who want to enjoy their favorite meals at home (Erdiansyah and Imaningsih, 2021).

Over time, business actors followed the market demand regarding Thai tea drinks due to the increasing market demand related to these beverages. This is evident from the fact that Thai tea is one of the beverage products that is often ordered by Generation Z through an online application (Akhmadi *et al.*, 2021). However, some business actors allegedly disregard the drink's food safety. Business actors cheated by adding food additives, in the form of cyclamates, to Thai tea drinks. Some drink products still contain excessive levels of the artificial sweetener cyclamate. This might be due to economic reasons, as businesses aim to maximize profits with minimal capital investment. Research by Zarwinda *et al.* at Ulee Lheu Tourist Attraction Banda Aceh found that of the 10 Thai tea samples tested, 5 positive samples contained sodium cyclamate, which exceeded the established threshold (Zarwinda *et al.*, 2024).

Tea is the second-most consumed beverage globally, boasting a rich array of bioactive compounds, including catechins and alkaloids, that contribute to its renowned health benefits. A study conducted by Yi *et al.* (2015) delves into the intricate composition of seven types of tea, revealing a nuanced interplay of constituents influenced by the distinctive processing methods employed for each variety. However, while these variations lend each type of tea its unique characteristics, some may resort to the addition of food additives, like cyclamates, to mitigate bitterness, compromising the purity and natural essence of the brew.

Business owners who think only about seeking profit do not care about the impact of adding cyclamates to the drinks they sell. Moreover, most people did not have sufficient knowledge about the permissible threshold levels of cyclamates. This is certainly dangerous for health because food additives, such as cyclamates, can cause health problems. Long-term consumption of cyclamate can increase the risk of various health problems, including elevated oxidative stress, potentially leading to chronic diseases, impaired metabolic functions such as increased blood sugar and lipid levels, and other negative effects on the body (Hasan *et al.*, 2023). Thus, considering that the impact caused by the use of food additives, such as cyclamates, is very dangerous for health and that food safety is very important, it is necessary to conduct further research regarding whether or not there are still sellers who add food additives, in the form of cyclamates, in processed Thai tea drinks in the present period and measure knowledge as well as attitudes of several seller outlets of processed Thai tea drinks in the Surabaya and Sidoarjo areas registered on online food applications, namely Grab and Go-Jek. This study aims to find out whether there is a relationship between the knowledge and attitude of sellers and the presence or absence of cyclamate food additives used in Thai tea drinks, in the hope that consumers can be more careful when buying beverage products, especially Thai tea.

Materials and Methods

This study was approved by the Health Research Ethics Committee, Faculty of Public Health, University of Airlangga, with number 26/EA/KEPK/2021. This declaration of ethics was obtained on February 25, 2022. The research used a quantitative approach by choosing the type of analytical observational research and research design in a cross-sectional study.

This study used a cross-sectional design because it was easier to measure variables one at a time using a questionnaire, specifically using observational analytics to explain the condition of the relationship between independent and dependent variables. The population in this study is represented by Thai tea sellers who are members of online application-based food delivery services in the Surabaya and Sidoarjo areas by applying filters that have been adjusted to the preferences of the respondents, namely a rating of 4.5+, food promotions, super partners, and priority restaurants.

Based on a preliminary study looking at the population of Thai tea merchants through the Grab and Go-Jek applications on the GrabFood and GoFood service features by applying filters that have been adjusted to the preferences of the respondents (rating of 4.5+, food promos, superpartners, and priority restaurants), it was found that there was a total of 51 outlets registered with details: 23 outlets on GoFood and 28 outlets on GrabFood.

The total population used in this study consisted of 51 outlets. This will be used further in the calculation of the size of the sam-

ple. The method of calculating the size of the sample in this study uses the Slovin formula, as follows (Eqs. 1-5):

$$n = \frac{N}{1+Ne^2} \quad [\text{Eq. 1}]$$

$$n = \frac{51}{1+[51 \times (0.05)^2]} \quad [\text{Eq. 2}]$$

$$n = \frac{51}{1+[51 \times 0.0025]} \quad [\text{Eq. 3}]$$

$$n = \frac{51}{1.1275} \quad [\text{Eq. 4}]$$

$$n = 45.23 \sim 46 \quad [\text{Eq. 5}]$$

where n is the number of samples, N is the total population, and e is the fault tolerance limit (0.05).

In this study, we calculated a sample of at least 46 Thai tea drinks sold in Surabaya and Sidoarjo using the Slovin formula. The study sample was determined using probability sampling techniques. With the probability sampling method, sampling was carried out randomly from an existing population. The probability sampling technique used is simple random sampling, where every member of a population has an equal chance of being selected for the sample (Noor and Tajik, 2022).

Results

The characteristics of Thai tea traders in the Surabaya and Sidoarjo regions include age, gender, level of education, level of income, and length of time to sell. The data was obtained using questionnaires from 46 respondents, namely Thai tea merchants in the Surabaya and Sidoarjo areas who are members of online food applications such as GrabFood and GoFood. The characteristic data that has been obtained was analyzed descriptively and presented in the form of narratives and tables, as follows.

Characteristics of respondents

Age of the seller

In this research, the age of Thai tea traders in the Surabaya and Sidoarjo regions is categorized into four categories: early adulthood, late adulthood, early elderly, and late elderly. The age range for early adulthood is 20-35 years, for late adulthood it is 36-45 years, for early elderly it is 46-55 years, and for late elderly it is 56-65 years. Table 1 details the age distribution of Thai tea traders in this study. Table 1 shows that most of the Thai tea traders or sellers who participated in this study were in the early adulthood category, with an age range of 18-35 years (93.5%); they were followed by participants in the late adulthood category, with an age range 36-45 years (2.2%), and the early elderly category, with an age range of 46-55 years (4.3%).

Gender

The gender characteristics of merchants were included in this study to determine how many sellers or vendors of processed Thai

tea drinks were female or male. Table 1 shows the sex distribution of Thai tea traders: 78.3% of Thai tea merchants or sellers were females, and 21.7% were males.

Level of education

The level of education of the traders included in this study was divided into four categories, namely elementary school, junior high school, high school, and university. Table 1 reports the distribution of the level of education of Thai tea traders: 84.8% of Thai tea traders or sellers completed high school, 13% completed college, and 2.2% completed elementary school.

Income level

In this study, the merchant's income level was categorized into three groups: i) < Indonesian Rupiah (IDR) 4,300,000; ii) IDR 4,300,000-5,000,000; and iii) >5,000,000. This category has been adjusted to the minimum regional salary of the Surabaya and Sidoarjo regions, which is IDR 4,375,497 and Sidoarjo IDR 4,293,581 (Table 1). Based on the results, 76.1% of the respondents had an average monthly income of <IDR 4,300,000; 13% had an average monthly income of IDR 4,300,000-5,000,000; and 10.9% had an average monthly income of >IDR 5,000,000.

Length of time to sell or work

The length of selling traders in this study is categorized into four groups: i) <7 years (new); ii) 8-14 years (long enough); iii) 15-21 years (long); and iv) >22 years (very long). Table 1 shows the distribution of the length of selling of Thai tea traders in this study: 100% of respondents had been selling/working for less than 7 years.

Knowledge

Thai tea traders' knowledge of the use of cyclamate is divided into three categories, namely sufficient, good, and less. By score criteria: i) score 8-14 = good; ii) score 5-7 = sufficient; and iii) score <5 = less. There were 14 questions to measure the respondents' knowledge using a questionnaire. Table 2 details the distribution of knowledge and attitudes of traders in Surabaya and Sidoarjo in 2022.

Attitude

The attitude of Thai tea traders towards the use of cyclamates is divided into two categories, namely, positive and negative. The criteria for the score results are as follows: a score of 26-36 is positive, and a score of 9-25 is negative. In the questionnaire, there were nine questions to measure respondents' attitudes. The distribution of Thai tea traders' attitudes towards the use of cyclamates in this study was as follows: 52.2% of respondents showed negative attitudes, and 47.8% showed positive attitudes.

Qualitative test of cyclamate

In this study, 46 samples of Thai tea beverage products were tested qualitatively to see whether there were cyclamates. The distribution of cyclamate content was qualitatively tested in Thai tea drinks. Qualitative testing of Thai tea drinks found that 95.7% of samples did not contain cyclamate, as indicated by the absence of a white precipitate. However, cyclamate was detected in 4.3% of samples through the presence of a white precipitate.

Statistical analysis

Logistic regression

The results of the analysis of sellers' knowledge variables with the use of cyclamate. Specifically, there was an absence of a significant relationship between respondents' knowledge and the use of cyclamates. The result of the analysis of the variables of the traders' attitudes with the use of cyclamate showed no significant relationship between respondents' attitudes against the use of cyclamate.

Specifically, the logistic regression analysis shows that the knowledge level has a 95% confidence interval of [0.159-5.153] and a significance value of 4.3, suggesting that there is no significant effect of knowledge level on cyclamate use.

Table 1. Respondents' characteristics in Surabaya and Sidoarjo in 2022.

	Distribution	
	Count	% of total
Sex		
Male	10	21.7
Female	36	78.3
Age		
Early adulthood: 18-35 years	43	93.5
Late adulthood: 36-45 years	1	2.2
Pre-elderly years: 46-55 years	2	4.3
Final level of education		
Elementary school	1	2.2
High school	39	84.8
University	6	13
Average monthly income		
<4,300,000	35	76.1
4,300,000-5,000,000	6	13
>5,000,000	5	10.9
Length of time to work or sell		
<7 years	46	100
Knowledge level of respondents		
Score 8-14: good	18	39.1
Score 5-7: sufficient	13	28.3
Score <5: less	15	32.6
Attitudes		
Score 26-36: positive	22	47.8
Score 9-25: negative	24	52.2
Cyclamate test in samples		
White precipitate	2	4.3
No white precipitate	44	95.7

The statistical test results of logistic regression and chi-square analysis for knowledge and attitude levels towards cyclamate use in Surabaya and Sidoarjo in 2022 indicate that there is no significant relationship between these variables and the use of cyclamate.

Table 2. Distribution of knowledge and attitude of traders in Surabaya and Sidoarjo in 2022.

Attitude	Knowledge			Total	p
	Good	Sufficient	Less		
Positive	1	3	4	8	0.251
Neutral	8	7	8	23	0.251
Negative	9	3	3	15	0.251
Total	18	13	15	46	0.251

Similarly, the attitude variable has a 95% confidence interval of [0.059-20.586] and a significance value of 0.950, further indicating a non-significant relationship. These high significance values suggest that neither knowledge level nor attitude significantly impacts cyclamate use.

Chi-square

We did not find a significant relationship between knowledge and the use of cyclamates. Also, our results indicate the absence of a significant relationship between the attitudes of the respondents and the use of cyclamates. Moreover, based on the Chi-square test, there is no significant relationship between respondents' attitudes towards respondents' knowledge and cluster distribution.

The Chi-square analysis shows significance values for knowledge level ($p=0.654$), attitudes ($p=0.950$), and the combination of knowledge and attitudes ($p=0.251$). This confirms that there is no significant relationship between knowledge level, attitudes, or their combination and cyclamate use (all $p>0.05$).

Discussion

The characteristics of Thai tea traders are important to understand the behavior of people preparing Thai tea. The aim of this study is to identify the characteristics of respondents who are willing to fill out the questionnaire according to a predetermined sample. This section will provide an overview of the distribution of the characteristics of the respondents. This also determined the extent to which the identity of the respondent can be known. The characteristics of respondents in this study include age, gender, level of education, income level, and length of selling.

Based on the results of the processing of questionnaire data, it was shown that the age of Thai tea traders was dominated by early adulthood with an age range of 18-35 years (93.5%), followed by the early elderly age with an age range of 46-55 years (4.3%) and late adult age with an age range of 36-45 years (2.2%). This shows that the respondents in this study already have representatives of the age range group that has been determined in the operational definition. This difference in the age group of respondents caused differences in responses in the interview process of filling out the questionnaire. Of course, this can be due to the age factor of the respondents; so, in respondents who are classified as elderly, it takes longer to explain the process of providing information or education and the process of filling out questionnaires. This can also be because, at the age of the elderly, there are changes in the physical and physiological functions of the body. Then, the gender of respondents in the study showed that the majority of Thai tea traders were female (36).

Based on the results regarding the final level of education, most respondents had a high school education, followed by university education, and elementary school education. No one had a final education in junior high school. Thus, it is hoped that the higher the level of education, the wider the knowledge of respondents, and the easier and faster it will be to receive various information about artificial sweetener food additives (Jamil *et al.*, 2017). Then, in this study, the income level of the majority of respondents was less than IDR 4,300,000, with a relatively short length of selling or working, which was less than 7 years. The respondent's length of selling or working can affect the respondent's income level. The length of time during which a business actor or businessman pursues his business field affects his productivity, ability, or expertise. This can have an impact on increasing

efficiency and the ability to reduce production costs (Jamil *et al.*, 2017).

In this study, respondents were asked questions related to their knowledge of the use of food additives. The questions contained in this section have four multiple-choice answer options so that the respondents can choose an answer according to their knowledge. The questions for measuring the knowledge of respondents were 14 and had the following assessment criteria: "true" got a score of 1, with a maximum score of 14, and "false" got a score of 0, with a minimum score of 0. After getting the score results, the score was categorized and given a value, including a score of 8-14 classified as "good", a score of 5-7 classified as "enough", and a score of <5 classified as "less". The results showed that out of 46 respondents, most of the knowledge levels of Thai tea traders in this study were good, which amounted to 18 people (39.1%), followed by the level of knowledge classified as less, which amounted to 15 people (32.6%), and the level of knowledge classified as enough, which amounted to 13 people (28.3%).

From the processing and analysis of questionnaire data, all questionnaire knowledge questions showed that the average respondent knew the purpose of adding food additives to food. This is evidenced by the results of the questionnaire, which showed 38 respondents correctly answered the question "what is the purpose of providing food additives?" on the questionnaire. Moreover, the respondents of this study, on average, did not know whether the products they sold contained cyclamates and how many doses were allowed in the daily use of cyclamates. This is evidenced by the fact that an average of 42 respondents incorrectly answered the two knowledge questions in this study questionnaire. According to the questionnaire results, the respondents' understanding of food additives is commendable. This is because, according to Suparmi and Desanti (2016), this knowledge encompasses understanding the definition of food additives, comprehending the government's permissible and prohibited food additives, comprehending the concept of artificial sweeteners, which are food additives used to enhance food sweetness, comprehending that one of the goals of using a sweetener is to enhance the sweetness of a food product, and comprehending the impact of using sweetening ingredients, among other things, can lead to long-term cancer.

Based on the results of the logistic regression statistical test, the level of knowledge with the use of cyclamates showed that there was no relationship between respondents' knowledge of the use of cyclamates with a significance and odd ratio of 0.905, which means that the knowledge variable has a lower risk of influence of 0.905, when compared to other variables, namely attitudes and behaviors. Based on the results of the Chi-square test, knowledge of the use of cyclamate also showed no relationship between respondents' knowledge and the use of cyclamates, with a significance value of 0.654 greater than $\alpha>0.05$. This is in line with the results of Putri (2015), that show that there is no meaningful relationship between the level of knowledge of traders and the use of excess cyclamate in school children's snack food and Based on the results of Dewi (2019), a p-value of 0.206 was obtained so that it can be concluded that there is no relationship between knowledge and the use of cyclamates in beverage sellers in elementary schools in the Telanaipura sub-district of Jambi City.

In this study, which also tried to see the relationship between aspects of knowledge and attitudes that have been analyzed with the K-means cluster, it was found that there was no good relationship between the variables. This is shown by the distribution of clusters, which shows that there are respondents with good knowledge, but their attitudes are classified as negative and neutral. So,

from current and previous research, a common thread can be drawn: good knowledge does not necessarily guarantee that traders have a good attitude and do not use cyclamate in their trading products.

Attitude measurement used a questionnaire containing statements to measure the attitudes of respondents related to the use of food additives. The statements to measure respondents' attitudes were nine with two categories, namely "positive question category" [with the assessment of strongly agree (4), agree (3), disagree (2), and strongly disagree (1)] and the "negative question category" [with the assessment of strongly agree (1), agree (2), disagree (3), strongly disagree (4)]. The maximum score was 36, and the minimum score was 9. After getting the score results, the score was categorized and given values, including a score of 26-36 classified as "positive" and a score of 9-25 classified as "negative". However, the attitude also used classification using the K-means cluster test to see more diversity of respondents' attitudes. K-means cluster uses three categories, namely with a value of 1, meaning that the respondent's attitude is "negative"; with a value of 2, meaning that the respondent's attitude is "neutral"; and with a value of 3, meaning that the respondent's attitude is "positive".

The results showed that 24 Thai tea traders had a negative attitude (52.2%), and 22 had a positive attitude (47.8%). The difference in the attitudes of these respondents is small; that is, 2 people are more dominantly negative. Then, based on the results of the K-means cluster, it was found that the respondent's attitude was more dominant in the neutral attitude (50%). According to Islamiyati (2015), this can be based on feelings of like or dislike, which can ultimately affect a person's response to objects. Attitude is a reaction or response of a person who is still closed to a stimulus or object, where the manifestation of the attitude cannot be directly seen, but can only be interpreted in advance of closed behavior.

Based on the results of the questionnaire, respondents in this study preferred to "disagree" with the second statement, namely that Thai tea drinks that are sold are not safe for continuous consumption; therefore, it can be assumed that the respondents of this study feel safe if they consume continuously the Thai tea drinks, they sell. In fact, Setyawati and Rimawati (2016) explained that fast drinks have high protein, calories, and fat values, as well as the presence of food additives, such as preservatives, dyes, and artificial sweeteners. Therefore, health experts advise Thai tea lovers not to consume it excessively because it can cause health problems, including obesity, diabetes, heart disease and cancer. Based on the result of the statistical test of logistic regression regarding attitudes and the use of cyclamates, there is no relationship between respondents' attitudes towards the use of cyclamates, with a significance value of 0.950 and an odds ratio of 1.099 which means that attitude variables have a higher risk of influence, when compared to knowledge variables and are lower behavior variables.

Based on the results of the Chi-square test, attitudes toward the use of cyclamates also showed no relationship with respondents' attitudes towards the use of cyclamates, with a significance value of 0.950. This is in line with the research by Nursiana *et al.* (2019), whose results of the Chi-square test showed $p=0.378$, more than $p>0.05$; so, it can be concluded that there is no relationship between the attitude of traders and the content of cyclamate in cendol drinks in North Pontianak District. This is also in line with the results of Putri (2015), which also showed that there was no relationship between merchants' attitudes and the use of excess cyclamate in school children's snack food, with $p=0.49$ greater than $p>0.05$. In relation, Wicker (1969) explained that attitudes do not necessarily determine the existence of one's behavior, due to the

presence of other factors that can influence one's actions, such as the social environment.

The results of qualitative cyclamate content tests on 46 samples of Thai tea beverage products sold online in the Surabaya and Sidoarjo areas showed that 44 were negative and 2 were suspected to be positive and contain cyclamate. This is because the two samples showed white deposits when tested qualitatively. However, to be more certain, the 2 samples that were suspected to be positive for containing cyclamate were tested quantitatively through the Surabaya Health Laboratory Center (BBLK). The researcher submitted the sample as determined by BBLK Surabaya and waited for 12 working days to get a report on the results of the quantitative testing process. The results report showed that the two samples were positive to contain artificial sweeteners, namely cyclamate, with a limit of quantification (LoQ) of 10 mg/kg.

Based on the results of the laboratory testing of two samples of Thai tea beverage products, which showed that the samples were positive to contain cyclamate with a LoQ of 10 mg/kg, the level was compared with the threshold level for using cyclamate that had been set. It turns out that these levels are still below the safe threshold: cyclamate has a threshold of 1.250 mg/kg of the product (BPOM RI, 2017), and cyclamate has an acceptable daily intake of 0-11 mg/kg body weight (Standar Nasional Indonesia, 2004). Therefore, the Thai tea beverage product that has been quantitatively tested can be categorized as safe for consumption.

Conclusions

In conclusion, the level of knowledge of traders regarding food additives at Thai tea processed beverage sellers is quite good. However, the attitudes of traders are classified as negative. Of 46 samples, there were 44 negative samples and 2 positive samples containing cyclamates in processed Thai tea drinks sold on online application-based food delivery services in the Surabaya and Sidoarjo areas, which were tested qualitatively. Then, the 2 positive samples were tested again quantitatively, obtaining a cyclamate level of $LoQ < 10$ mg/kg. These levels are below the predetermined threshold; therefore, these samples remain safe for consumption. Finally, based on the results of statistical tests, both in chi-square and logistic regression, there is no relationship between the level of knowledge and the attitude of traders towards the use of cyclic food additives in processed Thai tea drinks sold on online application-based food delivery services in the Surabaya and Sidoarjo areas.

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