

Correlation Between Market Community Knowledge and Rhodamine B Findings in Bangka Belitung Traditional Markets

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ABSTRACT / ABSTRAK

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Food safety, especially the use of rhodamine B as a coloring agent, is an important public health issue. Public knowledge regarding the use of this substance is important, as it may influence consumption patterns. This research aims to determine the correlation between the level of market community knowledge and the use of rhodamine B in food products across six traditional markets on Bangka Belitung Island. Random surveys were conducted among buyers, traders, community groups, and market officers to assess market knowledge. To determine the rhodamine B content, selected samples, based on color, texture, and other risk factors, were tested using a rapid test kit. The survey results showed that the level of market community knowledge ranged from 59.38 – 100%. Of the 102 tests, 16 samples tested positive for rhodamine B. The positive samples were shrimp paste, apem, mutiara sago porridge, and ice cream cones. To determine the correlation, the two variables were tested using the Pearson correlation test in SPSS version 16. The test results showed a significance value of Sig. 0.078 > alpha 0.05 with a confidence level of 95%, which means no statistical correlation between the variables being compared. The study showed that a higher level of market community knowledge did not guarantee lower rhodamine B use, and vice versa. However, other factors that may influence rhodamine B use in food on Bangka Belitung Island warrant further study.

Keamanan pangan, khususnya penggunaan rhodamin B sebagai pewarna, merupakan isu penting yang memengaruhi kesehatan masyarakat. Pengetahuan masyarakat mengenai penggunaan zat ini menjadi faktor krusial karena dapat memengaruhi pola konsumsi. Penelitian ini bertujuan untuk mengetahui hubungan antara tingkat pengetahuan komunitas pasar dan penggunaan rhodamin B pada produk pangan di enam pasar tradisional di Pulau Bangka Belitung. Metode survei acak terhadap pembeli, pedagang, kelompok masyarakat, dan petugas pasar dilakukan untuk mengetahui tingkat pengetahuan komunitas pasar. Sampling dan pengujian dilakukan untuk mengetahui kandungan rhodamin B. Sampel dipilih berdasarkan warna, tekstur, dan faktor risiko lainnya. Pengujian dilakukan menggunakan rapid test kit rhodamine B. Hasil survei menunjukkan tingkat pengetahuan komunitas pasar berkisar antara 59,38 – 90,69%. Dari 92 pengujian, terdapat 16 sampel positif rhodamin B. Sampel yang positif mengandung rhodamin B berupa terasi, apem, bubur sago mutiara, dan cone ice cream. Untuk mengetahui korelasi, kedua variabel diuji dengan menggunakan uji Pearson pada SPSS versi 16. Hasil pengujian menunjukkan nilai signifikansi Sig. 0,145 > alpha 0,05 dengan tingkat kepercayaan 95%. Tidak ada korelasi secara statistik antara variabel yang dibandingkan. Hasil penelitian menunjukkan bahwa semakin tinggi tingkat pengetahuan komunitas pasar tidak menjamin semakin rendahnya penggunaan rhodamin B pada pasar tersebut, begitu pula sebaliknya. Namun, terdapat 3 pasar dengan tingkat pengetahuan tinggi yang menunjukkan

penggunaan rhodamin B sebesar 0%. Terdapat faktor lain yang dapat berpengaruh pada tingkat penggunaan rhodamin B pada pangan di Pulau Bangka Belitung sehingga perlu dikaji dan dianalisis.

Keywords: coloring agent, food, food safety, market, rhodamine B

Kata kunci: keamanan pangan, makanan, pasar, rhodamine B, zat pewarna

1. Introduction

Safe food is not only a basic human need but also essential for leading a healthy, high-quality life. There are three main criteria for classifying food as safe: it must be free from physical, biological, and chemical contamination. Currently, the types of food available to the public are extremely diverse. Producers are undertaking various innovative efforts to boost consumer interest. These include adding preservatives, sweeteners, or colorants to enhance product appeal (Putri et al., 2017).

Although the government regulates the use of food additives, hazardous substances are still being detected as food additives. According to the 2023 annual report from the Indonesian Food and Drug Authority Regional Office in Pangkal Pinang, 21 samples tested positive for rhodamine B, 1 sample contained methanil yellow, and 3 samples contained formalin (BPOM, 2023). These hazardous substances are examples of chemical contaminants in food.

One type of chemical frequently added to food is food coloring. In fact, most people prefer synthetic food colorings to natural ones because they are more practical and stable. (Muthmainnah et al., 2017). The type of synthetic food coloring most commonly misused is rhodamine B (Sulistina & Martini, 2020). Rhodamine B is characterized by a bright, vivid red color when dissolved; in its original form, it is a powder with a green or reddish-purple hue (Putriningtyas et al., 2017). This substance is actually used as a dye in paper and textile products (Laksmi W et al., 2018). However, in some products, such as chili sauce, crackers, and certain snacks, manufacturers often add the hazardous substance rhodamine B as a colorant (Agsari & Guntarti, 2023). People still use this dye because it is relatively affordable.

Foods containing rhodamine B are typically a strikingly bright red. If consumed over the long term, this substance can trigger liver and kidney disorders and may even lead to liver cancer (Nisa et al., 2022). This threat has become a particular concern for the government. The Food and Drug Authority (BPOM) consistently makes efforts to curb the use of hazardous substances in processed foods. Various programs are implemented, including testing food product samples, taking enforcement action against violations, and providing information and education to the public. These information programs target certain community groups. Market communities—such as vendors, consumers, management staff, and associations—are key targets for raising awareness. People who are aware of the dangers of a product are less likely to consume it (Sillia et al., 2022).

Survey results conducted by the Central Statistics Agency (BPS) in 2020 indicate that there are 16,235 traditional markets across all regions of Indonesia (BPS, 2020). Traditional markets serve as strategic venues for a range of purposes. The large number of these markets necessitates efforts to ensure food safety, as the majority of the public obtains food from them.

As part of efforts to oversee food safety implementation, the Indonesian Food and Drug Authority Regional Office in Pangkal Pinang implemented the Community-Based Safe Food Market Program (PPABK) in several markets across the Bangka Belitung Islands from 2020 to 2023. The stages of the activities included cross-sectoral advocacy; technical guidance for market officials; information, communication, and education (ICE) through outreach and market campaigns; and monitoring through sampling and testing. Additionally, the implemented program is monitored and evaluated annually.

Consumer knowledge of food safety and the health impacts of using these hazardous substances plays a crucial role in shaping attitudes toward food products containing rhodamine B (Upadhyay et al., 2023). Therefore, to enhance public awareness, it is necessary to provide an understanding of the chemical properties, health effects, and strategies for managing these hazardous substances (Sulastri et al., 2023). To ensure food safety, awareness is required among all parties involved in the food-handling process (Baptista et al., 2020), including producers, traders, and consumers.

Research on the correlation between knowledge and behavioral patterns among vendors was previously conducted by Putri et al. (2017) in traditional markets throughout the city of Mataram. The results revealed a relationship between vendors' knowledge and behavior regarding the use of rhodamine B in shrimp paste products. However, this study has a limitation: no rhodamine B testing was conducted on the samples, so the data on rhodamine B use levels are based solely on the results of the respondents' questionnaire. A similar study was also conducted by Hidayah et al. (2017). The results indicated no correlation between educational level and the knowledge of mixed ice sellers regarding the rhodamine B content in kolang kaling fruit in Padang City. No research has examined the correlation between market community knowledge and the use of rhodamine B in food at traditional markets on Bangka Belitung Island; therefore, a study on this topic is necessary. This is important to determine the extent to which market community knowledge influences the use of rhodamine B.

The analyses conducted in this study include an assessment of the market community's knowledge of hazardous substances, an analysis of rhodamine B content test results for food sold in traditional markets on Bangka Belitung Island, and a correlation test between these two variables.

2. Methodology

This study employed a quantitative approach by collecting questionnaire data. The level of market community knowledge regarding hazardous substances was obtained through a survey conducted during community-based safe market campaigns held from 2021 to 2023 at six traditional markets in the Bangka Belitung Islands. Additionally, this study used data from rhodamine B rapid test results for food products collected at six traditional markets in the Bangka Belitung Islands in 2023. The research was conducted in two phases: survey data were processed in Microsoft Excel to determine the percentage of the market community's knowledge regarding hazardous substances. Data from the rhodamine B test were analyzed in Microsoft Excel to determine the percentage of rhodamine B-positive samples. Subsequently, the data were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) version 16.

The survey was conducted using a Google Form questionnaire distributed via the WhatsApp app. The questionnaire contained several questions regarding hazardous

substances in food. This list of questions was developed by the Directorate of Community Empowerment and Processed Food Business Operators at the Indonesian Food and Drug Authority. The market community comprises the supply side (market managers, market vendors, market associations, suppliers) and the demand side (market visitors). The number of respondents per market ranged from 20 to 50; this sample size is expected to adequately reflect the market community's level of knowledge.

Sampling and testing activities were conducted during the community-based safe food market monitoring and evaluation by the Infokom Working Group of the Indonesian Food and Drug Authority Regional Office in Pangkal Pinang in 2023. Samples were collected randomly, prioritizing food items at higher risk of containing hazardous substances. The food items sampled included shrimp paste, wet noodles, brightly colored pastries, crackers, meatballs, tofu, and several other food products. These samples were tested for rhodamine B content using a rapid test kit (Tyagi et al., 2023).

After data on the market community's knowledge level and the results of rhodamine B testing of food products were obtained, a Pearson correlation analysis was conducted. In several studies analyzing relationships among two or more parameters, the Pearson correlation test is commonly used (Tyagi et al., 2023). The researchers hypothesized a statistically significant correlation between the market community's level of knowledge and the use of rhodamine B in food products at traditional markets in the Bangka Belitung Islands.

3. Results and Discussion

The survey results on market communities' awareness of the hazardous substance rhodamine B at six traditional markets on Bangka Belitung Island are presented in Table 1.

Table 1. Survey Results on Awareness of Hazardous Substances

Market Name	Survey Results			
	Total Respondents	Respondents with insufficient understanding	Respondents with Knowledge	Level of Knowledge (%)
Mentok Market	43	4	39	90.69
Parittiga Market	32	13	19	59.38
Higienis Air Ruai Market	44	10	34	72.27
Kenanga Market	25	4	21	84.00
Berehun Market	25	4	21	84.00
Induk Tanjung Pandan Market	32	3	29	90.63

Survey data indicate that knowledge levels among market communities range from 59.38% to 90.69%. The lowest knowledge levels were found at Parittiga Market and Air Ruai Hygienic Market, with scores of 59.38% and 72.27%, respectively. Some respondents are still unaware of the types of hazardous substances, including their characteristics and the consequences of their use. This lack of awareness may stem from insufficient literacy or information among the public. Some respondents stated they would still purchase food suspected of containing rhodamine B. This is because the effects of consuming food

containing rhodamine B are long-term rather than immediate. Health issues begin to manifest only after several years of exposure to rhodamine B (Putri et al., 2017). The public perceives no immediate threat from consuming the substance.

In addition to the survey, sampling, and testing were also conducted on food products sold in traditional markets. Samples were collected at random based on the risk factors associated with the food products. Samples were selected based on their color, texture, or other distinctive characteristics. The results of the rhodamine B tests are presented in Table 2.

Table 2. Rhodamine B Test Results

Market Name	Total Samples	Positive Rhodamine B	Percentage of positive samples (%)
Pasar Mentok	25	5	20.00
Pasar Parittiga	31	10	32.25
Pasar Higienis Air Ruai	9	1	11.11
Pasar Kenanga	12	0	0
Pasar Berehun	5	0	0
Pasar Induk Tanjungpandan	10	0	0

The testing was conducted using a rhodamine B rapid test kit; in addition to being practical and easy to use, this test is capable of providing accurate results (Sulastri et al., 2023). Among the 92 samples tested, 16 (17.39%) tested positive for rhodamine B. Among the positive samples, 5 shrimp paste samples were found at Mentok Market. Seven shrimp paste samples, 2 apem cake samples, and 1 pearl sago porridge sample were found at Parittiga Market. 1 sample of ice cream cones was found at Air Ruai Hygienic Market. This indicates that the misuse of rhodamine B still occurs frequently. A study conducted by Agsari and Guntarti (2023) reported similar results: of 282 tested samples, 84 (30%) were positive for rhodamine B.

The primary factor driving producers to continue adding rhodamine B to food products is the substance's ability to impart color to food (Sulastri et al., 2023). According to Muthmainnah et al. (2017), shrimp paste containing rhodamine B appears redder than natural shrimp paste. This is appealing to both vendors and consumers.

Subsequently, the two variables were analyzed using SPSS Version 16. A normality test of the data using the Kolmogorov-Smirnov test was performed first to select the appropriate correlation method. The results of the Kolmogorov-Smirnov test showed that the Sig values were 0.693 and 0.714, both $> \alpha = 0.05$, so the data are normally distributed. Next, the Pearson test was used to determine the correlation between the two variables. The Pearson test is often used to determine the correlation between two or more variables (Tyagi et al., 2023). The results of the analysis using the Pearson test are listed in Table 3.

The significance value of Sig. 0.145 is greater than alpha 0.05 at a 95% confidence level. Therefore, H_0 is rejected in this analysis, indicating that there is no statistically significant relationship between the two variables. The data show that the Mentok Market community's knowledge level falls into the high category at 90.69%. However, this is not consistent with the 20% rate of rhodamine B use. Conversely, in the Kenanga Market and Berehun Market

communities, the survey results showed a lower level of knowledge at 84.00%. In comparison, rhodamine B usage was 0% (no products containing rhodamine B were found).

Table 3. Pearson Correlation Test Results

		Level of Knowledge	The usage of Rhodamine B
Level of Knowledge	Pearson Correlation	1	-0.671
	Sig.(2-tailed)	-	0.145
The usage of Rhodamine B	Pearson Correlation	-0.671	1
	Sig.(2-tailed)	0.145	-
	N	7	7

Based on the results of this study, it is evident that a high level of knowledge within a market community does not guarantee that the market is free from hazardous substances. Vendors were unaware of the presence of rhodamine B in the products they sold; they assumed the red color came from the shrimp or rebon used (Amir & Mahdi, 2017). The public believes that the redder the terasi product, the more shrimp or rebon is used. Increased knowledge and awareness among producers and suppliers are needed to ensure market safety.

The results of this study contradict those of Putri et al. (2017), who reported a statistical correlation between vendors' knowledge levels and rhodamine B use. However, a limitation of this study is that the data on rhodamine B usage levels were based solely on surveys and interviews with vendors (the accuracy of the data depends on respondents' honesty) and did not include testing the rhodamine B content in the products. Ideally, rhodamine B usage should be measured based on test results, in line with the approach used by Hidayah et al. (2017) to measure rhodamine B usage in kolang kaling fruit in Padang City. It is hoped that conducting testing will yield more valid data.

Respondents in this study consisted of vendors, buyers, associations, and market officials. These respondents were not necessarily the producers of the tested samples. A high level of knowledge within the market community does not guarantee low rhodamine B use. This is evident in the Mentok Market community. Although respondents possess high levels of knowledge, they have not been able to conduct an in-depth analysis of rhodamine B content. If food suspected of containing rhodamine B is found in that market, the action taken is not to purchase it, nor to report it to market officials for investigation.

To minimize the practice of using rhodamine B in food, the BPOM collaborates with relevant cross-sectoral agencies (BPOM, 2024). Drug and food surveillance will be more effective with strong collaboration and synergy among various parties. This surveillance involves various communities, as shown in Figure 1.

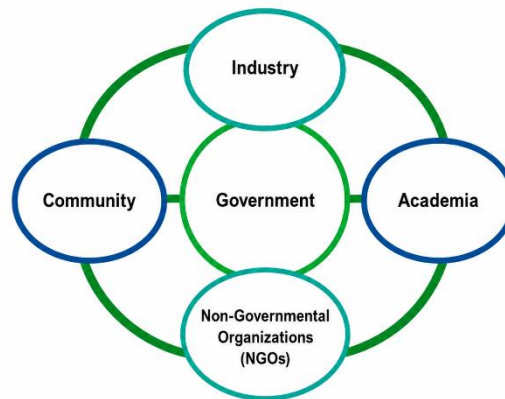


Figure 1. The Five Pillars of Drug and Food Regulation
Source: <https://pentahelix.eu>.

All elements within the five pillars of oversight play a crucial role. The government, through the Minister of Trade Regulation, under No. 8/M-DAG/PER/6/2006 on the Distribution and Oversight of Hazardous Substances, can restrict the circulation of rhodamine B. If the circulation of this substance is regulated through clear mechanisms, it is expected to prevent and reduce the misuse of rhodamine B in food.

Raising awareness and knowledge among the industry and business operators is crucial. Producers who are aware of the dangers posed by this substance can choose to use synthetic dyes designated for food use (food-grade). The roles of consumers and retailers are no less important; these two groups serve as the final filter in the food distribution process. Consumers with a high level of knowledge can protect themselves and their families from the dangers posed by rhodamine B. It is hoped that a decline in consumer demand will minimize the leakage of hazardous substances into traditional markets.

Along with technological advancements, academics play a vital role in researching the effects of rhodamine B. By relying on scientific data, it becomes easier to raise public awareness of its dangers. The media plays a strategic role in expanding the dissemination of information regarding the dangers of rhodamine B to the public. Through collaboration and synergy among all stakeholders, it is hoped that the use of rhodamine B in food can be minimized.

The Indonesian Food and Drug Authority Regional Office in Pangkal Pinang has made efforts to provide information and education to market communities to enhance their knowledge and awareness of the dangers of hazardous substances, including rhodamine B. Additionally, annual monitoring and evaluation of food safety in markets are conducted to ensure that food is safe for public consumption. However, cooperation among relevant parties is necessary to ensure consistent food safety in Bangka Belitung Province.

A limitation of this study is the lack of complete information regarding respondent data, such as age, education, and gender. This information is considered important to draw more comprehensive conclusions. Additionally, there is no information regarding the source of the tested products. These products were produced by vendors selling them or supplied by manufacturers outside the market community. This information is crucial for tracing the source of Rhodamine B and its distribution process.

In future research, an analysis could be conducted on the correlation between producers' knowledge levels regarding hazardous substances and the use of rhodamine B in food

products on Bangka Belitung Island. Furthermore, the level of knowledge about hazardous substances in school and village communities could also be investigated. Consequently, data-driven conclusions could be drawn to support the creation of policies aimed at ensuring optimal food safety.

4. Conclusion

The market community's knowledge of hazardous substances ranged from 59.38% to 90.69%. The Parittiga market community had the lowest level of knowledge at 59.38%. Based on the rhodamine B content test results for food products being sold, 16 of 92 samples tested were positive for rhodamine B. The results of the Pearson correlation test on these two variables showed a significance value of $\text{Sig. } 0.145 > \alpha 0.05$ at a 95% confidence level, indicating that there is no statistically significant correlation between the market community's level of knowledge and the use of rhodamine B in food products across the 6 traditional markets on Bangka Belitung Island. However, in some markets, such as Kenanga Market, Berehun Market, and Induk Tanjungpandan Market, high levels of knowledge and behavior have led to a decrease in rhodamine B use. Thus, communication, information, and education within market communities positively affect food safety in the Bangka Belitung Islands. Other factors that may influence the use of rhodamine B need to be studied and analyzed to minimize its use.

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