



## Quality and Safety Profile of Chili Sauce in Cirebon City

Salwa Oksiputri Aulia

Universitas Swadaya Gunung Jati, Indonesia

Email: salwaoksiputriaulia@gmail.com

### Abstract

*The quality and safety standards of chili sauce are determined in SNI 01-2976-2006. It states that if chili sauce is not handled and processed properly, it can be contaminated with hazardous substances that cause disease or poisoning, such as Rhodamine B. Long-term consumption of Rhodamine B may lead to liver dysfunction or malignancy. To observe the quality and safety of chili sauce based on its characteristics and to identify the use of Rhodamine B dye in chili sauce sold with snacks around Bima Stadium. This study was conducted descriptively using a qualitative laboratory approach at the Research Laboratory of Swadaya Gunung Jati University. Sampling was carried out using total sampling from food vendors around Bima Stadium, Cirebon City, who met the inclusion criteria. Samples were examined for chili sauce characteristics in terms of aroma, appearance, and color and tested for Rhodamine B content using the Rhodamine B Rapid Test Kit (Labtest Reagent®). Data were obtained from 18 samples, analyzed descriptively, and presented in tables accompanied by narrative explanations. Of the 18 samples, 2 samples (11.1%) of chili sauce tested positive for Rhodamine B, while 16 samples (88.9%) were negative. Abnormal aromatic characteristics were found in 3 samples (16.7%), whereas 15 samples (83.3%) were normal. Based on appearance, 4 samples (22.2%) were abnormal and 14 samples (77.8%) were normal. In terms of color, 2 samples (11.1%) were abnormal and 16 samples (88.9%) were normal. Rhodamine B and abnormal physical characteristics were found in some chili sauce samples.*

### Keywords:

*chili sauce; characteristics; quality profile; safety profile; rhodamine B*

## INTRODUCTION

Chili sauce is a complementary ingredient used to enhance the palatability of food; it may be in a thick or liquid form, with chili as the main ingredient, a stimulating aroma, and a spicy taste, and it has a long shelf life because it contains sugar, salt, and often preservatives. Chili sauce products are widely distributed in Indonesia, and their consumption is often not monitored because of their role as a condiment (Peraturan Menteri Kesehatan RI, 2012; Anyanwu et al., 2022).

In Law No. 18 of 2012 and in the Regulation of the Head of the BPOM Agency Number HK 03.1.23.04.12.2206 of 2012 concerning Good Food Production Methods for the Household Industry, it is explained that the production process must be properly controlled to ensure food safety and food quality, as well as halal product assurance when required. The control of this production process includes the regulation of sanitation, packaging, and the use of food additives such as dyes. Dyes are generally used to improve the marketing appeal of a product (Peraturan Menteri Kesehatan RI, 2012; Undang-Undang RI, 2012; Peraturan Kepala BPOM, 2012).

According to the Regulation of the Minister of Health Number 33 of 2012, Food Additives (Bahan Tambahan Pangan/BTP) are substances that are intentionally added to food to affect the properties or form of food, including dyes, flavorings, preservatives, thickeners, firming agents, and leavening agents (Peraturan Menteri Kesehatan RI, 2012). The use of BTP

has been regulated in the Regulation of the Minister of Health, which includes a list of synthetic dyes that are not allowed for consumption or use in cosmetics. Rhodamin B is one of the banned synthetic dyes (Peraturan Menteri Kesehatan RI, 2012).

Rhodamin B (RhB) is classified as a xenobiotic substance metabolized by cytochrome P450 in the body, producing free radicals such as Reactive Oxygen Species (ROS) (Priya et al., 2024; Sharma et al., 2022). This affects the activity of Superoxide Dismutase (SOD), leading to increased oxidative stress, cell injury, and apoptosis. SOD enzymes are the most important endogenous antioxidants and have the ability to reduce the effects of oxidative stress. They catalyze the conversion of superoxide into hydrogen peroxide and oxygen and play an important role in protecting body cells and preventing inflammation caused by free radicals (Dewi & Martini, 2020).

Rhodamin B has been widely used since the 1800s to improve the color quality of products such as textiles and food. However, after thorough safety evaluations, there is sufficient evidence to suggest that RhB is carcinogenic and toxic (Dewi & Martini, 2020). Therefore, the Food and Drug Supervisory Agency (BPOM) has prohibited its use in food through BPOM RI Regulation No. 37 and Permenkes RI No. 239/Menkes/Per/V/1985 and No. 033/Menkes/Per/IX/2012 regarding the prohibition of synthetic dyes. Although RhB and other hazardous BTP are banned by the government, they are still found in various foods and drinks sold on the streets (Peraturan Menteri Kesehatan RI, 2012; Peraturan Menteri Kesehatan RI, 1985; BPOM RI, 2022).

According to the 2022 BPOM Balai Besar/Balai/Loka POM report, most food poisoning incidents are caused by microorganisms and chemicals. Factors contributing to this include public ignorance about cross-contamination and dyes, the lower price of industrial dyes compared to food-grade dyes, and the fact that textile dyes generally have more attractive and stable colors (BPOM RI, 2022).

Based on the report, from 26 provinces there were 72 Extraordinary Events of Food Poisoning (Kejadian Luar Biasa Keracunan Pangan/KLB KP) with 5,505 people exposed. Household cooking has been the highest food source causing KLB KP for the past 4 years, but snack activities contributed 30% of KLB KP cases and even dominated as the source of food poisoning, with 21 out of 72 recorded incidents originating from snack activities.

The illegal use of RhB can be found worldwide and in a variety of products such as candy, bakery products, chili and pepper products, turmeric, and even cosmetics. Research conducted by Wang et al. (2018) in China found that 22.7% of chili powder samples, 18.5% of pepper powder samples, 11.1% of chili oil samples, and 9.1% of pepper oil samples were contaminated with RhB (Wang et al., 2018). Another study by Varghese and Ramamoorthy (2023) found that the extensive use of unauthorised dyes is a common practice in different regions of India; dyes such as Rhodamin B, methanol yellow, orange II, malachite green, auramine, quinoline yellow, amaranth, and Sudan dyes have been detected in various foods (Varghese & Ramamoorthy, 2023). The research of Bhooma et al. (2020) identified at least 20 RhB-contaminated samples from 104 samples collected from 16 countries (Bhooma et al., 2020).

The use of rhodamin B as BTP in Indonesia can be seen from the 2011 annual report of BPOM RI: out of 20,511 snack samples in circulation, 197 were positive for Rhodamin B. In 2012, BPOM conducted a study on snack samples in elementary schools across 30 cities in

Indonesia; of 6,044 samples, 49 were positive for rhodamin B. In 2015, of 13,974 samples tested, 110 were positive for RhB (BPOM RI, 2022).

The results of previous research conducted by Londong et al. (2017) showed that all 6 samples of skewered meatball sauce sold around Sam Ratulangi University Manado were positive for RhB. Research by Amelia and Zairinayati (2020) showed that out of 18 tomato sauce samples circulating in the Palembang City market, 12 samples were positive for Rhodamin B (Londong et al., 2017; Amelia & Zairinayati, 2020).

Although many studies have examined Rhodamine B contamination in food products, most research has focused on large markets or packaged products. Studies specifically examining chili sauce used by street food vendors in public gathering areas are still limited. Street food environments carry a higher risk of food safety issues because products are often produced in small-scale settings with minimal supervision and limited food safety control. Therefore, it is important to conduct research that evaluates the quality and safety of chili sauce used by street food vendors in specific community environments.

Bima Stadium in Cirebon City is a public area frequently visited by students, athletes, and the local community. The area is surrounded by schools and often becomes a gathering place for people to buy snacks from street vendors. Many of these foods are served with chili sauce, making the safety and quality of the chili sauce used in this area a significant concern. However, information regarding the characteristics and safety profile of chili sauce sold around Bima Stadium is still limited.

Based on this background, this study aims to examine the quality and safety profile of chili sauce sold around Bima Stadium in Cirebon City by analyzing its physical characteristics and detecting the presence of Rhodamine B dye. The study is expected to provide several benefits. From a public health perspective, the results of this research can provide important information regarding potential food safety risks associated with chili sauce sold by street food vendors. From an academic perspective, the study can contribute to the scientific literature related to food safety and the misuse of prohibited food additives. Furthermore, the findings of this research can serve as a reference for health authorities and policymakers in strengthening food safety monitoring and education for food vendors and the community.

## RESEARCH METHOD

This research is an analytical descriptive research. The method used for the analysis of the Rhodamin B content in chili sauce is the *rapid test kit/colorimetric technique*.

### Population And Sample

#### A. Target Population

The population in this study is chili sauce used by food traders in Cirebon City.

#### B. Affordable Population

The affordable population of this study is chili sauce used by food traders in the area around Bima Stadium, Cirebon City.

### C. Research Sample

#### 1. Kriteria Inklusi

- a. Chili sauce sold by traders in the area around Bima Stadium.
- b. Chili sauce sold by traders who are willing to be used as research samples.

## 2. Exclusion Criteria

- a. Chili sauce registered in BPOM's food distribution permit.

### D. How to Sample

Sampling is carried out in *total sampling*, which is a sample determination technique when all members of the population are used as samples. In the total sampling, all chili sauce used by traders around Bima Stadium and met the inclusion criteria was included in the study.

### E. Sample Size

The *total sampling* method is a sampling method where the number of samples is equal to the number of populations. So the samples taken in this study are all chili sauce used by food traders in the area around Bima Stadium, Cirebon City.

### How Data Is Collected

#### A. Test the Characteristics of Chili Sauce

##### 1. Observation Methods

Morissan stated that: Observation or observation is a daily human activity using the five senses as the main tool. In other words, observation is an activity that involves all the powers of the senses such as hearing, sight, taste, touch, and taste based on the facts of empirical events.<sup>(34)</sup> The characteristic testing procedure is as follows:

- a. Take about 2-grams that you want to observe and place them on a porcelain drip plate or other flat surface.
- b. Samples were observed their characteristics based on smell, appearance and color with the sense of sight and smell by the researcher and two other volunteers.
- c. The observation results were compared with negative control samples and BPOM Chili Sauce/Chili Sauce Food Production Guidelines.<sup>(25)</sup>

#### B. Rhodamin B Content Test

##### 1. Tools and Materials

The tools used are stirring rods, funnels, erlenmeyers, measuring cups, porcelain cups, test tube clamps, drip pipettes, test tube racks, test tubes and analytical scales. The ingredients used were aquadest, Rhodamin B *rapid test kit* from Labtest Reagent ® and snack sauce samples. The Rhodamin B *Test Kit* consists of two reagent solutions or reagents, namely reagent A which contains the reagent solution SbCl<sub>5</sub> (Stibium Chloride) in HCl 5 N and reagent B which contains the reagent solution toluene (C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>).

##### 2. Qualitative Analysis With *Rapid Test Kit*

The qualitative test of Rhodamin B uses the *rapid test kit method*. The testing procedure is as follows:

- a. Take about 2-grams of the sample you want to observe, then place it in a porcelain cup.
- b. Add 5 ml of boiling water and stir so that the Rhodamin B in the sample is attracted to the water, then let it cool.
- c. Take a sample solution of 1-3 ml and then put it in the test tube.
- d. Take 1 drop of reagent A and shake until homogeneous.
- e. The red color in the solution will settle or decrease in color intensity depending on the presence or absence of RhB.
- f. Add 3 drops of reagent B then beat again.
- g. Observe the color change.

If the color of the solution changes to reddish purple or violet, the sample is positive and if the color does not change to reddish purple or the color remains the same, the sample does not contain Rhodamin B and is negative.

The red color change occurs due to the formation of a brick-red complex compound from RhB with antimony salts that dissolve in organic solvents. Meanwhile, the sample results were negative because there was no reaction between the RhB reagent and the sample. The formation of a brick-red color from the result of the reaction of RhB with the antimony salts present in the reagent (Sulastri et al., 2023).

### **3. Validasi *Rapid Test Kit***

To determine the validity of the reagent *test kit* used in this study, a validation kit was carried out to find out whether the *test kit* used was in accordance with the claims that were useful for testing RhB. Validation of this kit was carried out using positive control and negative control of RhB. Positive control in this study used RhB compound itself, and negative control was "X" chili sauce which has a distribution permit and is sold in Cirebon city supermarket.

### **Research Procedure**

#### **A. Preparation Stage**

1. Determination of titles, problem formulations and hypotheses from the research
2. Consultation with the supervisor regarding the title, research variables and research methods to be used.
3. Study literature
4. Preparing research instruments
5. Obtain the necessary research permits and coordinate with the heads of relevant agencies
6. Setting a schedule of data collection activities

#### **B. Implementation Stage**

1. Determine the sample according to the inclusion and exclusion criteria.
2. Researchers searched for chili sauce samples from traders around the Bima Stadium area.
3. The researcher tested the sample with observation and *a rapid test kit*.

#### **C. Completion Stage**

1. The researcher processed the data and analyzed the data obtained.
2. The researcher compiled a research report.

### **Data Analysis**

#### **A. Univariate Analysis**

Univariate analysis is an analysis of each variable of the research results. In general, in univariate analysis, this only produces the distribution and percentage of each variable.

Data processing is carried out descriptively. The data obtained is tabulated using computer *software* and then analyzed descriptively and presented in the form of a table and explained in the form of a narrative, the data will be calculated as a frequency distribution with normal/positive and abnormal/negative percentages using formulas and conclusions are drawn.

The formula used is as follows:

$$\frac{X}{N} \times 100\%$$

Description:

X = number of normal/positive (+) or abnormal/negative samples (-)

N = the total number of samples studied.

## RESULTS AND DISCUSSION

### Research Results

In this study, an analysis of Rhodamin B in chili sauce from traders circulating in the area around Bima Stadium was carried out that met the criteria of inclusion and exclusion using *colorimetric* methods and observation using the senses of sight (eyes) and smell (nose). The samples taken were 18 from different traders, namely the A-R sample.

#### 1. Chili Sauce Characteristics Test

The characteristics of chili sauce can be identified based on the aroma of appearance and color observed using the senses of sight (eyes) and smell (nose). Based on the results of research that has been carried out in the laboratory of the Faculty of Medicine, Swadaya University of Gunung Jati, the following results were obtained:

**Table 1.** Results of Examination of Characteristics of Chili Sauce

Sample	Aroma	Sightings	Color
A	Normal: Chili specials	Abnormal: non-homogeneous, soft and clumpy granules	Normal: Dark red-orange
B	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
C	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Dark red-orange
D	Normal: Chili specials	Abnormal: homogeneous, coarse, and lumpy granules	Normal: Dark orange
E	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Not normal: Red beetroot
F	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Bright orange
G	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Abnormal: red liver
H	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
I	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
J	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
Sample	Aroma	Sightings	Color
K	Abnormal: Stinging acid	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Bright orange
L	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
M	Not normal: Metallic smell	Abnormal: non-homogeneous, non-coagulating and soft granules	Normal: Bright orange

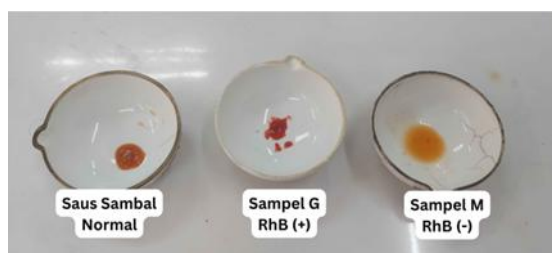
Sample	Aroma	Sightings	Color
N	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
O	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange Sunny
P	Not normal: Acid	Abnormal: homogeneous, coarse, and lumpy granules	Normal: Red-orange
Q	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Red-orange
R	Normal: Chili specials	Normal: Homogeneous evenly, soft granules and not clumping	Normal: Bright orange

Source: Primary data processed by the author (2025)

**Table 2.** Frequency Distribution of Chili Sauce by Characteristics

Variabel	Normal		Abnormal	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
<b>Aroma</b>	15	83,3%	3	16,7%
<b>Sightings</b>	14	77,8%	4	22,2%
<b>Color</b>	16	88,9%	2	11,1%

Source: Primary data processed by the author (2025)



**Figure 1.** Chili Sauce Characteristic Test

Source: Documentation of research results, processed by the author (2025)

Based on tables 1 and 2, it was found that the frequency distribution in 18 chili sauce samples was obtained with 15 samples that had normal characteristics based on aroma (83.3%) and 3 samples had abnormal aroma characteristics (16.7%). Then, 14 samples were obtained with normal characteristics based on appearance (77.8%) and 4 samples had abnormal appearance characteristics (22.2%). In addition, it was also found that 16 samples had normal characteristics based on color (88.9%) and 2 samples were found to have abnormal color characteristics (11.1%).

## 2. Qualitative Test of Rhodamin B Content

The test was a *colorimetric* test of two repetitions on each sample using  $SbCl_5$  in HCl 5 N and toluene reagent solution ( $C_6H_5CH_3$ ). The results obtained can be seen in the table below:

**Table 3.** Qualitative Test Results Data

Yes	Sample	Color Reaction Test	Observation of Color Change	Results
1	Sample A	1st	Dark Brown	Negatives
		2nd	Dark Brown	Negatives

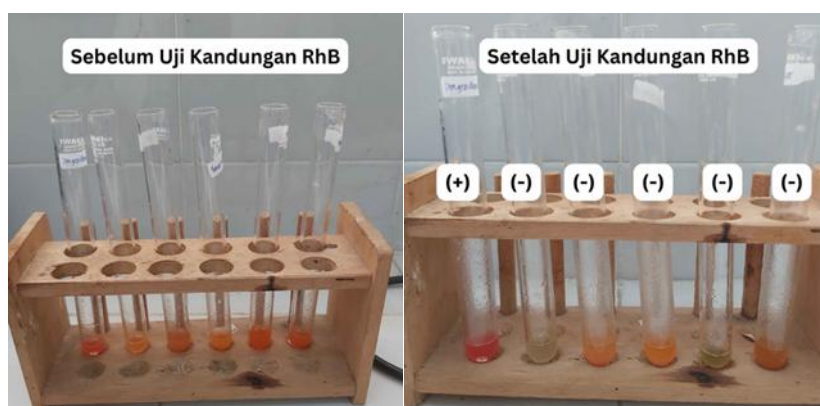
Yes	Sample	Color Reaction Test	Observation of Color Change	Results
2	Sample B	1st	Cloudy	Negatives
		2nd	Cloudy	Negatives
3	Sample C	1st	Cloudy brown	Negatives
		2nd	Cloudy brown	Negatives
4	Sample D	1st	Does not change color	Negatives
		2nd	Unchanged Color	Negatives
5	Sample E	1st	Dark pink	Positive
		2nd	Light purple	Positive
6	Sample F	1st	Does not change color	Negatives
		2nd	Does not change color	Negatives
7	Sample G	1st	Pink cerah	Positive
		2nd	Dark pink	Positive
8	Sample H	1st	Does not change color	Negatives
		2nd	Does not change color	Negatives
9	Sample I	1st	Does not change color	Negatives
		2nd	Does not change color	Negatives
10	Sample J	1st	Does not change color	Negatives
		2nd	Does not change color	Negatives
11	Sample K	1st	Pale orange	Negatives
		2nd	Bright orange	Negatives
12	Sample L	1st	Does not change color	Negatives
		2nd	Does not change color	Negatives
13	Sample M	1st	Dark green	Negatives
		2nd	Brownish-green	Negatives
14	Sample N	1st	Cloudy orange	Negatives
		2nd	Dark orange	Negatives
15	Sample O	1st	Pale orange	Negatives
		2nd	Pale orange	Negatives
Yes	Sample	Color Reaction Test	Observation of Color Change	Results
16	Sample P	1st	Cloudy yellow	Negatives
		2nd	Pale orange	Negatives
17	Sample Q	1st	Pale orange	Negatives
		2nd	Pale orange	Negatives
18	Sample R	1st	Cloudy	Negatives
		2nd	Pale green	Negatives
Positive Control				
19	RhB		Dark purple	Positive

Source: Primary data processed by the author (2025)

The results obtained from 18 samples were carried out with two repetitions, 2 of the 18 samples obtained positive results, namely in samples labeled E and G because it was characterized by no loss of pink color at the time of the addition of concentrated HCl (reagent A) and color change to purple/dark pink at the addition of  $C_{6H_5CH_3}$  (reagent B). Meanwhile, in samples other than E and G, namely as many as 16 samples obtained results that did not change color, become green or bleach color. This proves that the sample was negatively tested to contain Rhodamin B.



**Figure 2.** Positive Control Rhodamin B Content Test Results  
Source: Laboratory documentation, processed by the author (2025)



**Figure 3.** Rhodamin B Content Test Results of Samples G, B, K, L, M, N  
Source: Laboratory documentation, processed by the author (2025)

The Rhodamin B *Test Kit* consists of two reagent solutions or reagents, namely reagent A which contains the reagent solution  $\text{SbCl}_5$  (Stibium Chloride) in HCl 5 N and reagent B which contains the reagent solution toluene ( $\text{C}_6\text{H}_5\text{CH}_3$ ). Foodstuffs containing Rhodamin B are characterized by the absence of red color in the solution during the addition of reagent A which is done by strong shaking and the formation of complexes that result in a reddish-purple color change in the solution when reagent B is added. This is caused by reagent A, namely HCl 5 N or acidic hydrochloric acid interacting with the composition of the chili sauce to produce this color. From the explanation above, we can summarize the frequency of qualitative tests of chili sauce in table 4.4 below. The results of the qualitative test were found to be 2 positive samples (11.1%) and negative as many as 16 samples (88.9%).

**Table 4.** Frequency Distribution of Chili Sauce Based on Qualitative Test of Rhodamin B Content

Sample	Positive		Negatives	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Sambal Sauce	2	11,1%	16	88,9%
<b>Total</b>			18	

Source: Primary data processed by the author (2025)

## Discussion of Research Results

Based on the results of the research presented above, as many as 18 samples of chili sauce that have been studied based on characteristics, it was found that 3 samples (16.7%) had an abnormal aroma (smelled sour and metallic) and 15 other samples (83.3%) had a normal aroma. In addition, 4 samples (22.2%) were found to have abnormal appearances (inhomogeneous, coarse and clumpy grains) and 14 other samples (77.8%) had normal appearances. In the characteristics of chili sauce based on color, it was found that 2 samples (11.1%) were abnormal (red color of liver and red beets) and 16 other samples (88.9%) looked normal. All samples containing RhB only had abnormal color characteristics, while samples found not to contain RhB had abnormal characteristics, either based on aroma or appearance.

According to research by Kaur et al. (2021) entitled *Effect of chilli varieties and storage conditions on quality attributes of honey chilli sauce: A preservation study*, and research by Li et al. (2022) entitled *Unraveling the difference in physicochemical properties, sensory, and volatile profiles of dry chili sauce and traditional fresh dry chili sauce fermented by Lactobacillus plantarum PC8 using electronic nose and HS-SPME-GC-MS*, the characteristics of chili sauce may change due to the process of making chili sauce that uses different chili peppers, fermentation processes, different basic ingredients or the type of packaging used so that it may result in abnormal characteristics (Kaur et al., 2021; Li et al., 2022).

Research by Sjarif and Apriani also states that color changes can be caused by the addition of BTP in the form of synthetic dyes and the large amount of its use can affect the color intensity of chili sauce. The use of synthetic dyes such as Allura Red AC or Ponceau 4R and the addition of a large amount of them can make the color of the chili sauce a striking red (Sjarif & Apriani, 2018).

The use of RhB in food for a long time (chronic) will result in impaired liver function or malignancy, however, if exposed to large amounts of RhB, in a short time there will be symptoms of acute RhB poisoning (Fitriani & Ariyanti, 2016). If used as a dye in cosmetics or inhaled, it will cause irritation to the exposed area. The side effects of the use of RhB dye are chronic toxic and carcinogenic. Chronic toxic effects occur when the use of RhB dye in small doses continuously so that it is deposited in the body. RhB cannot be metabolized by the liver so that there is a buildup of RhB in the liver which will cause impaired liver function. The chemical structure of RhB contains elements  $N^+$  (nitronium) and chlorine ( $Cl^-$ ) compounds which are carcinogenic so that they spur the growth of cancer cells and cause liver cancer (Fikri & Firmansyah, 2023; Ahsyaf et al., 2023; Sulastris et al., 2023).

The Food and Drug Supervisory Agency has banned its use in food, drugs and cosmetics since the Decree of the Director General of Drug and Food Supervision Number: 00386/C/SK/II/90 concerning amendments to the attachment to the Regulation of the Minister of Health Number: 239/Menkes/Per/V/85. This prohibition is mentioned and further strengthened in BPOM RI Regulation No. 37 and Minister of Health Regulation No. 033/Menkes/Per/IX/2012 (Peraturan Menteri Kesehatan RI, 2012; Peraturan Menteri Kesehatan RI, 1985; BPOM RI, 2022; Keputusan Dirjen POM, 1990). This regulation is supported by Law Number 18 of 2012 Article 75 paragraph (1) concerning Food: "Every person who conducts Food Production for circulation is prohibited from using: food additives that exceed the maximum threshold set; and/or materials that are prohibited from being used as materials." Violation of the provisions of this article is subject to the threat of criminal sanctions

as referred to in Law No. 18 of 2012 Article 136 which states that every person who conducts Food Production for distribution who deliberately uses BTP exceeds the maximum threshold set or materials that are prohibited from being used as BTP as referred to in Article 75 paragraph (1) shall be sentenced to a maximum of 5 (five) years in prison or a maximum fine of Rp. 10,000,000,000.00 (ten billion rupiah) (Undang-Undang RI, 2012).

The crime, although heavy, does not prevent the use of dangerous BTP materials. From the previous literature, it can be seen that there are various factors that affect the use of harmful dyes, namely food traders who want to make a profit or due to negligence factors in their products, public ignorance, relatively cheap dye prices, easy to obtain, good and striking colors and attract children's attention, and high temperature resistance and durability (Ganesh Pawar & Kulkarni, 2022). Other factors include low supervision of the ban on the use of harmful dyes and construction that is still lacking or not at all. This is similar to a study by Miratania and Rahmalia (2019) entitled *Factors Related to Traders' Behavior in the Use of Snack Food Additives for School Children at SDN Teluk Pucung VII Bekasi City in 2019*, where the study concluded that the factors of knowledge, attitudes and coaching and supervision have a significant relationship with the use of BTP (Miratania & Rahmalia, 2019).

Based on the results of this study, from 18 samples taken from the area around Bima Cirebon Stadium and tested in the laboratory of the Faculty of Medicine, Swadaya Gunung Jati University, RhB content was found in 2 samples of chili sauce studied (11.1%) from 18 samples. These results are similar to a previous study conducted by Ganesh Pawar and Kulkarni (2022) entitled *Detection of Rhodamine B Dye in Tomato, Red Chilli and Szechuan Sauces Served by Street Food Joints In Pune City (India)* (Ganesh Pawar & Kulkarni, 2022). Ganesh Pawar and Kulkarni's research identified 10 out of 25 samples of chili sauce positive for RhB.

RhB can also be found in other food products such as in a study by Mahardika et al. (2022) entitled *Analysis of Rhodamine B content in shrimp pastes at Ciroyom Market, Bandung City, West Java, Indonesia* (Mahardika et al., 2022). This study identified Rhodamin B in all 10 samples, with concentrations ranging from 1.79 ppm to 3.999 ppm. Therefore, it can be concluded that the abuse of Rhodamin B in food is still rampant.

The toxicity effects of RhB have been proven by research and case studies conducted in previous years. Experimental research by Rohmawati et al. (2021) showed results that Rhodamin b as a chemical compound was able to reduce the number of primary follicles of white rat ovaries so that it could be a significant factor in the incidence of infertility disorders. This is because RhB is able to bind to halogen compounds that are reactive so that they can damage cells (Rohmawati et al., 2021).

Another experiment conducted by Dewi and Martini (2020) showed that RhB tends to increase the expression of BAX, which is a protein that triggers cell death, which directly decreases BCL-2, which is an oncogene-derived protein that provides negative control of cellular apoptosis pathways in the cerebral tissue and brainstem in *Rattus norvegicus* along with increasing dose (Dewi & Martini, 2020).

Food coloring still plays an important role in many products, which makes it engaging, appetizing, and informative. Dye additives serve as a kind of code that allows people to recognize the product when they see it, such as the taste of candy, the dosage of the drug, and the left or right contact lens. The color of food has also been found to influence human behavior toward food (Spence & Schweiggert, 2024). As technological advances and research continue

with the discovery of new synthetic dyes or the discovery of the dangers of old dyes, the laws of what is and what is not allowed are also evolving. The Minister of Health of the Republic of Indonesia and BPOM each stated in the Regulation of the Minister of Health No. 033/Menkes/Per/IX/2012 and BPOM Regulation Number 11 of 2019 that several synthetic red dyes are safe to consume in limited quantities and uses, including (Peraturan Menteri Kesehatan RI, 2012; Peraturan BPOM, 2019):

1. Karmoisin CI. No. 14720 (*carmoisine*)
2. Ponceau 4R CI. No. 16255 (*Ponceau 4R*)
3. Merah allura CI. No. 16035 (*Allura red*)

## CONCLUSION

There were 3 samples of chili sauce that had abnormal characteristics based on aroma, totaling 3 samples (16.7%), and 15 samples (83.3%) with normal aroma, while based on appearance characteristics, 4 samples (22.2%) were abnormal and 14 samples (77.8%) were normal. In addition, based on color characteristics, 2 abnormal samples (11.1%) and 16 normal samples (88.9%) were found. The use of Rhodamin B was identified among traders selling around Bima Stadium, Cirebon. It was found that 2 samples (11.1%) of chili sauce were positive for Rhodamin B, and 16 samples (88.9%) of chili sauce did not contain Rhodamin B. Based on these findings, it is recommended that food safety supervision be strengthened, particularly for street food vendors who frequently use chili sauce as a complementary ingredient in their products. Health authorities and related institutions should intensify routine monitoring and inspection of food products circulating in public areas to prevent the misuse of hazardous food additives. In addition, education and training programs for food vendors regarding safe food processing practices and the dangers of using prohibited substances such as Rhodamine B should be enhanced. Future research is also recommended to include a larger number of samples and broader research locations to obtain a more comprehensive understanding of food safety issues related to chili sauce and other street food products.

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