International Journal of Ecophysiology Vol. 05, No. 01, 2023 |19-35

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Internasional Journal of Ecophysiology

Borax analysis with spectrophotometry on meat bakso of frozen food that sold in modern markets and traditional markets in Palembang

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Abstract. [Meatballs are one of the processed meat products that are in great demand by all levels of society. Along with the times and changes in public consumption trends, currently meatballs are turning into frozen food which is more simple and practical for cooking anytime. As processed frozen meat, making frozen food meatballs are often added with food additives (BTP) to maintain food quality such as preservatives, thickeners, and dyes. Borax is a dangerous chemical that is often added to food as a thickening agent. This study aims to determine and compare frozen food meatballs sold in modern markets and traditional markets in Palembang City which contain borax based on physical tests and to analyze borax levels using UV-Vis spectrophotometry. In this study, the maximum wavelength obtained to measure the absorbance of the 10 samples that have been prepared is 423,50 nm. Determination of the standard borax solution curve that has been made with various concentrations were 5 ppm, 10 ppm, 20 ppm, and 30 ppm. The obtained linear equation y = 0,0352x + 0,2047 with coefficient correlation (r) 0,9631. The levels of borax contained in the frozen food meatballs as the research samples were sample A contained 13,322 µg/ml, sample B contained 9,392 µg/ml, sample C contained 12,688 µg/ml, sample D contained 23,379 µg/ml, sample E contained 29,127 µg /ml, sample F was 24,821 µg/ml, sample G was 17,583 µg/ml, sample H was 15,595 µg/ml, the sample I was 26,665 µg/ml, sample J was 12,460 µg/ml. Based on physical tests, the characteristics of frozen food meatballs containing borax showed a brighter color, an unnatural smell, very chewy, and hard texture that is difficult to destroy. In conclusion, the ten samples of frozen food meatballs tested all contained borax with varying levels.]

Keyword: [Meatballs, Frozen food, Borax, UV-Vis Spectrophotometry.]

Received [12 December 2022] | Revised [10 January 2023] | Accepted [20 February 2023]

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DOI: 10.32734/ijoep.v5i1.12342
Journal Homepage: http://ijoep.usu.ac.id

1 Introduction

Meatballs are food made from processed ground meat mixed with tapioca flour, seasonings and salt and then shaped into a ball. Meatballs can be served with sauce or by roasting, frying, or mixing them into other preparations.[1] Meatballs are a food choice that is in great demand by people of all levels, from children, adolescents and adults. The high consumption of meatballs is affected by various factors such as low prices, variations of meatballs, a distinctive taste, and it has nutritional ingredients.[2]

In this modern era, practical and instant food is the main choice for most people. The managers of traditional meatballs who produce meatballs on a home industry scale then innovate to produce on a large scale and commercialize them in bulk packaged in the form of vacuum packaging and marketed as meatball products frozen food.[3] Frozen food or processed frozen food products is a method of preserving food using low temperatures until it reaches the freezing point, which is approximately -10°C so that it has a long shelf life.[4]

Even though it is considered very practical, it is a processed product frozen food that uses Food Additives (BTP) which help maintain food quality. Not all food additives are safe to add to food, in fact, some additives may not be added to processed food because they can affect health. An example of a dangerous food additive is borax.[5]

Borax has the scientific name sodium tetraborate decahydrate with the chemical formula (Na2B4O2(H2O)10) is a chemical compound derivative of metal Boron (B) which is alkaline and can be stable under normal pressure and temperature.[6] Borax is normally used as an ingredient in detergents, bactericides, pesticides, cleaning agents and antiseptics.[7] The prohibition on the use of borax in food is listed in the Regulation of the Minister of Health of the Republic of Indonesia Number 33 of 2012 concerning Food Additives. Based on this legal basis, it is known that borax is a compound that is prohibited from being added to food in any small amount because it is harmful to health.[8,9]

Toxicity effects due to continuous consumption of borax in uncontrolled doses can cause clinical manifestations such as anorexia, hypotension, anemia, disorientation, hair loss, gastroenteritis, nausea, vomiting, shortness of breath, epigastric pain, melena, hematemesis and cephalgia.[10] Borax can cause systemic disturbances that affect sodium and potassium ion pumps which can cause damage to cells whose permeability increases so that cells become lysed and necrotic.[11] Complications that can arise from the chronic toxicity of borax use include respiratory failure, malignancy or cancer, kidney failure, coma and death if it enters the gastrointestinal tract of around 5-10 g/kg body weight.[12]

Research conducted by Gustini (2021) who conducted qualitative tests with turmeric paper and quantitative analysis using a UV-Vis spectrophotometer found one research sample, namely the code Ft3, which was proven to contain borax. The borax concentration in the sample obtained was 11.76 ug/mL so that the borax content in the Ft3 sample was 0.058%.[13]

Traditional markets are shopping centers that are built and managed by certain institutions such as government, private, BUMN and BUMD with places such as shops, kiosks, stalls, or tents occupied by small traders, business scale and small capital with purchases that occur through the process bargaining.[14] Similar to traditional markets, modern markets are also shopping centers formed by the government, the private sector, or cooperatives in the form of malls, minimarkets, supermarkets, department store, and shopping center which is managed with modernity and prioritizes service and consumer comfort under the supervision of a manager, with large capital, and accompanied by a price tag.[15]

Based on survey results in the city of Palembang there are lots of meatball products frozen food in traditional markets and modern markets which are still unbranded and do not have a distribution permit from BPOM. This can trigger doubts for consumers about the safety of these foods. It is feared that products which have not obtained permits from BPOM may contain some dangerous Food Additives (BTP), such as borax. The purpose of this study was to determine and analyze the borax content in meatballs frozen food which are sold in modern markets and traditional markets in Palembang City using UV-Vis spectrophotometry.

2 Research Method

This research is a qualitative descriptive research conducted in October - December 2022 and carried out at the Laboratory of Biochemistry and Medical Chemistry, Faculty of Medicine, Sriwijaya University. The target population in this study were all meatballs frozen food which is sold in Palembang and the population in this study are meatballs frozen food which are sold in modern markets and traditional markets in the city of Palembang. The research sample is meatballs frozen food that has not expired, sold in modern markets and traditional markets in Palembang and the period from October to December 2022 which meet the inclusion and exclusion criteria. In this study the sampling technique used is accidental sampling and the sample size in this study was 10 samples, namely 4 samples obtained from modern markets and 6 samples obtained from traditional markets. The inclusion criteria in this study were meatballs frozen food retail and packaging in good condition, sold directly in modern markets and traditional markets in Palembang. Exclusion criteria in this study were meatballs frozen food that has passed time expired and meatballs frozen food who already have BPOM distribution permits. Data analysis in this study used univariate analysis.

The tools used in this study included porcelain dishes, petri dishes, clamps, stirring rods, sparrows, centrifuges, digital scales, label paper, water bath, separatory funnel, spirit lamp, test tube, volumetric flask, erlenmeyer, mortar and pestle, glass beaker, volume pipette, micro pipe, filter paper, oven, and UV-Vis Spectrophotometer (Shimadzu UV 1800). The materials used in this study such as meatballs frozen food, distilled water, 0.125% curcumin, acetic acid, sulfuric acid, absolute ethanol, and 10% NaOH.

The work procedures carried out in the study are as follows:

a. Make supernatant from meatballs

1. Prepare samples of meatballs frozen food which have been purchased in modern markets and traditional markets in the city of Palembang
2. Meatball samples were given the same treatment, by weighing 5 g and then adding 10 ml of distilled water.
3. The sample is mashed using a mortar and alu or in a blender.
4. The refined sample is put into the centrifugation machine. Centrifuge using a speed of 3000 rpm and carried out in approximately 2 minutes.
5. Prepare filter paper to filter out the supernatant, then rinse again using distilled water.
6. The supernatant that has been obtained is then added with distilled water up to 25 ml.
7. The supernatant solution is ready to be used for quantitative analysis of borax using a UV-Vis spectrophotometer.

b. 0.125% curcumin solution

1. Weigh 125 mg of turmeric or curcumin powder
2. Put it in the measuring cup
3. Add a little concentrated acetic acid until dissolved
4. Then dilute it using acetic acid solution up to the mark line.

c. Sulfuric acid-acetic acid solution (1:1)

1. Put 100 ml of concentrated acetic acid into a 250 ml Erlenmeyer tube
2. Then mix the concentrated acetic acid little by little with concentrated sulfuric acid until homogeneous.

d. 10% NaOH solution

1. Weigh 10 g of NaOH and add distilled water until dissolved, then put into a 100 ml volumetric flask.
2. Add aquadest back up to the mark line.

e. Maximum Wavelength Analysis and Generation of Borax Standard Curves

1. Weigh 10 mg of borax powder and then dissolve it with distilled water up to 100 ml in a volumetric flask so that the concentration of the solution is 100 µg/mL. Perform concentration dilutions of 5 µg/mL, 10 µg/mL, 20 µg/mL, 30 µg/mL by taking the mother liquor using a pipette of 0.5 mL, 1 mL, 2 mL and 3 mL.
2. Each of the mother liquor that has been pipetted is put into a porcelain cup. Add 2 ml of 10% NaOH solution to the standard solution and then heat it over a water bath until the solution is dry. Heating is continued in the oven at 50°C for 5 minutes, then cooled.
3. Add 2 ml of 0.125% curcumin solution, then heat while stirring for 2 minutes. After the solution has cooled, add 2 ml of sulfuric acid solution and 2 ml of acetic acid. Stir the solution until the yellow color of curcumin disappears and let it stand for about 8 minutes, then add a little ethanol. The solution was filtered using filter paper and put into a 10 ml volumetric flask and diluted with 96% ethanol up to the mark line.
4. The maximum wavelength is determined using a standard borax solution of 20 µg/ml of pure borax. Observe the absorbance of this solution with a wavelength between 400 - 600 nm on a UV-Vis spectrophotometer.
5. The standard curve is measured by observing the absorbance of the standard solution which has obtained the maximum wavelength.

f. Determination of Borax Content in Meatballs

1. Meatball supernatant solution frozen food that had been pipetted as much as 1 ml and then added 10% NaOH solution as much as 2 ml into a porcelain cup. Heat until the solution dries. Then the heating process was continued in the oven at 50°C for 5 minutes. After drying, add 0.125% curcumin solution and reheat while stirring for 2 minutes then cool.
2. After cooling, the solution is added 2 ml of sulfuric acid solution and 2 ml of acetic acid then stir the solution until the yellow color disappears. The solution was allowed to stand for 8 minutes then added a little ethanol then filtered using filter paper. The solution was put into a 10 ml volumetric flask then diluted using 96% ethanol up to the mark line.
3. After that the filtered solution is collected and then observed and measured the absorbance of the sample at the maximum wavelength using a 96% ethanol blank.

g. Physical Test on Meatballs

1. Prepare meatballs that contain borax and do not contain borax which were made by the researchers themselves as a comparison, namely positive controls containing borax and negative controls of borax.
2. Perform macroscopic physical tests by paying attention to four parameters, color, smell, elasticity, and texture.
3. Record the test results into the observation sheet.
4. Compare the results of each sample with the two comparison meatballs.

3 Research Result

After conducting research through qualitative analysis using physical tests and quantitative analysis using the Uv-Vis spectrophotometry test, the results obtained were:

Qualitative Analysis

The qualitative analysis carried out in this study was a macroscopic physical test, by looking at physical characteristics and comparing borax meatballs and non-borax meatballs. In the physical test, the researchers made two comparisons, namely meatballs containing borax as a positive control and meatballs that did not contain borax as a negative control by the researchers themselves. The results of the physical tests that have been carried out are presented in table 1.

Table 1. Physical Test Results (Source: private collection)

No.	Sample Code	Physical Characteristics				Result
		Color	Smell	elasticity	Texture	
1.	Sample A (Modern)	Light brown mixed with white unevenly	Unnatural	a little chewy	Hard texture crumbles hardly	Contains borax
2.	Sample B (Modern)	Pale brown	Unnatural	Not chewy	Soft texture crumbles easily	Contains borax
3.	Sample C (Modern)	Light brown	Odorless	Chewy	Hard texture crumbles hardly	Contains borax
4.	Sample D (Modern)	Pale brown	Natural	A bit Chewy	Hard texture crumbles hardly	Contains borax
5.	Sample E (Traditional)	Pale brown	Natural	Chewy	Hard texture crumbles hardly	Contains borax
6.	Sample F (Traditional)	Pale brown	Unnatural	Chewy	Hard texture crumbles hardly	Contains borax
7.	Sample G (Traditional)	Bright grayish brown	Unnatural	A bit Chewy	Hard texture crumbles hardly	Contains borax
8.	Sample H (Traditional)	Light brown to white	Natural	A bit chewy	Hard texture crumbles	Contains borax

					hardly	
9.	Sample I (Traditional)	Bright brown	Unnatural	Very chewy	Hard texture crumbles hardly	Contains borax
10.	Sample J (Traditional)	Pale yellowish brown	Unnatural	Chewy	A bit soft crumbles easily	Contains borax
11.	Control +	Bright chocolate	Unnatural	Very chewy	Chewy crumbles a bit hard	Contains borax
12.	Control -	Pale brown	Natural	Not chewy	Soft texture crumbles easily	Without borax

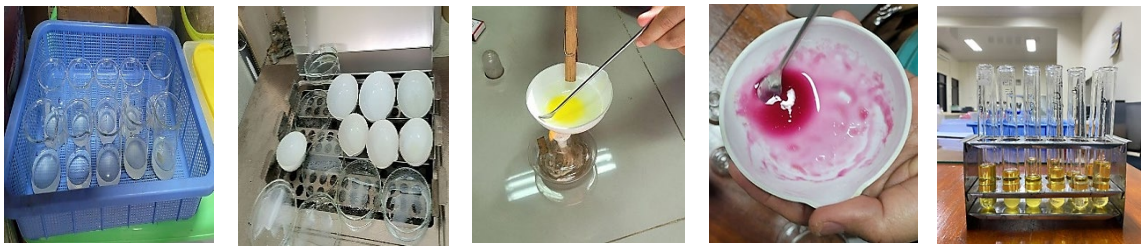
Table 1 shows that the ten samples taken have the characteristics of meatballs containing borax based on four parameters, namely, the color is brighter, the smell is unnatural, it is more chewy, and the texture is hard and difficult to crush. The results obtained were based on physical tests of the 10 samples tested. There were those that met all the criteria for borax meatballs, such as samples G and I, and there were other samples that only partially met the criteria for meatballs containing borax. Meatballs that are safe for consumption and do not contain borax have characteristics such as pale or light gray color, a slightly fishy meat odor, and are softer, as seen in the negative control.[16]

Quantitative Analysis

The quantitative test was carried out by measuring the absorbance of the borax content in the sample analyte using a UV-Vis spectrophotometer. The first step in the quantitative analysis is to determine the maximum wavelength of the standard borax solution which is measured in the wavelength of 400 nm – 750 nm.[17] Based on these measurements, the maximum wavelength is 423.50 nm.

The next step is to determine the standard borax solution curve with respective concentrations of 5 ppm, 10 ppm, 20 ppm, 30 ppm and measured at the maximum wavelength. From the borax calibration curve, we get a linear regression equation between concentration and absorbance, namely $y = 0.0352x + 0.2047$ with a correlation coefficient (r) 0.9631. Based on the theory that the correlation coefficient that is acceptable is if the value (R2) is close to 1. In this study the results of the correlation coefficient (r) were 0.9631, which means that there is a linear relationship between the absorbance and concentration curves so that it meets the

requirements.[18] After the analyte is prepared, it can proceed with the steps to determine the borax content in the sample by observing the absorbance as shown in the following figure:



Supernatan sample ad 25 ml aquadest | 1 ml supernatan + 2 ml NaOH 10% | Addition and heating of curcumin 0.125% | Addition of 2 ml of sulfuric acid – acetic acid 1:1 | Ready Analyte

Figure 1. Analyte Sample Process

Based on the steps above, after the sample analytes are prepared, absorbance measurements in spectrophotometry can be carried out immediately by measuring one sample three times with replications. The measurement results in this study are presented in table 2. The following:

Table 2. Spectrophotometric Test Results for Frozen Food Meatball Samples

(Source: private collection)

No.	Sample Code		Absorbance (A)	Borax Levels in the Sample	Average Borax Content	Result
1.	Sample A	A1	0,672	13,275 µg/ml	13,322 µg/ml	Low borax
		A2	0,664	13,048 µg/ml		
		A3	0,685	13,644 µg/ml		
2.	Sample B	B1	0,537	9,440 µg/ml	9,392 µg/ml	Low borax
		B2	0,518	8,900 µg/ml		
		B3	0,551	9,838 µg/ml		
3.	Sample C	C1	0,620	11,798 µg/ml	12.688 µg/ml	Low borax
		C2	0,693	13,872 µg/ml		
		C3	0,641	12,394 µg/ml		
4.	Sample D	D1	1,063	24,383 µg/ml	23,379 µg/ml	Moderate borax
		D2	1,012	22,934 µg/ml		
		D3	1,008	22,821 µg/ml		
5.	Sample E	E1	1,209	28,531 µg/ml	29,127 µg/ml	Moderate borax
		E2	1,257	29,894 µg/ml		
		E3	1,224	28,957 µg/ml		
6.	Sample F	F1	1,098	25,386 µg/ml		Moderate

		F2	1,055	24,156 µg/ml	24,821 µg/ml	borax
		F3	1,082	24,923 µg/ml		
7.	Sample G	G1	0,845	18,190 µg/ml		Low borax
		G2	0,824	17,593 µg/ml	17,583 µg/ml	
		G3	0,802	16,968 µg/ml		
8.	Sample H	H1	0,772	16,116 µg/ml		Low borax
		H2	0,726	14,809 µg/ml	15,595 µg/ml	
		H3	0,763	15,860 µg/ml		
9.	Sample I	I1	1,129	26,258 µg/ml		Moderate borax
		I2	1,175	27,565 µg/ml	26,665 µg/ml	
		I3	1,126	26,173 µg/ml		
10.	Sample J	J1	0,658	12,877 µg/ml		Low borax
		J2	0,625	11,940 µg/ml	12,460 µg/ml	
		J3	0,647	12,565 µg/ml		

The average results of borax levels in meatball samples frozen food which have been examined using a spectrophotometer, are presented in the diagram below:

Quantitative Analysis

The quantitative test was carried out by measuring the absorbance of the borax content in the sample analyte using a UV-Vis spectrophotometer. The first step in the quantitative analysis is to determine the maximum wavelength of the standard borax solution which is measured in the wavelength of 400 nm – 750 nm.[17] Based on these measurements, the maximum wavelength is 423.50 nm. The next step is to determine the standard borax solution curve with respective concentrations of 5 ppm, 10 ppm, 20 ppm, 30 ppm and measured at the maximum wavelength. From the borax calibration curve, we get a linear regression equation between concentration and absorbance, namely y = 0.0352x + 0.2047 with a correlation coefficient (r) 0.9631. Based on the theory that the correlation coefficient that is acceptable is if the value (R2) is close to 1. In this study the results of the correlation coefficient (r) were 0.9631, which means that there is a linear relationship between the absorbance and concentration curves so that it meets the requirements.[18]

After the analyte is prepared, it can proceed with the steps to determine the borax content in the sample by observing the absorbance as shown in the following figure:

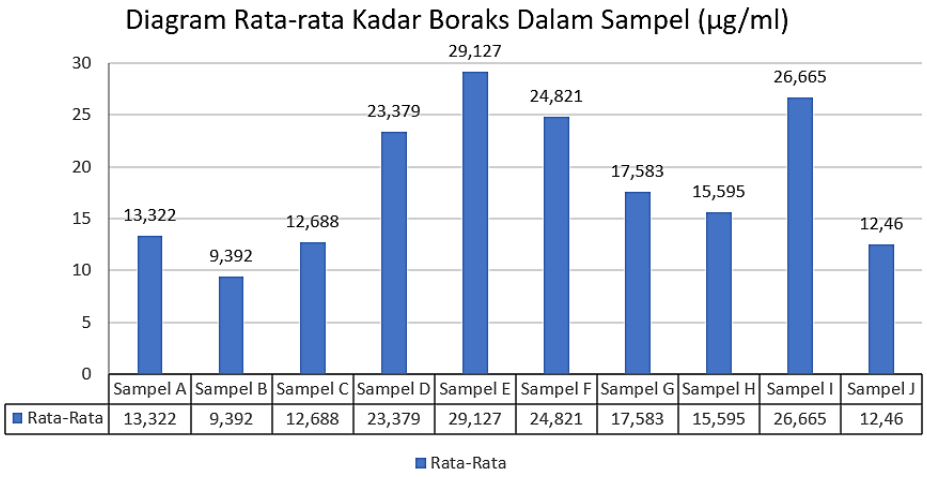


Figure 2. Average Borax Content Diagram in a Sample (Source: Private Collection)

After obtaining the results of the borax content in µg/ml units, the percentage of the borax content contained in the sample can be determined by calculating % b/b per 5 g of meatballs using the sample weight percentage formula and multiplied by the number of dilutions in the sample.19 Based on these calculations, the results are as shown in Figure 2.

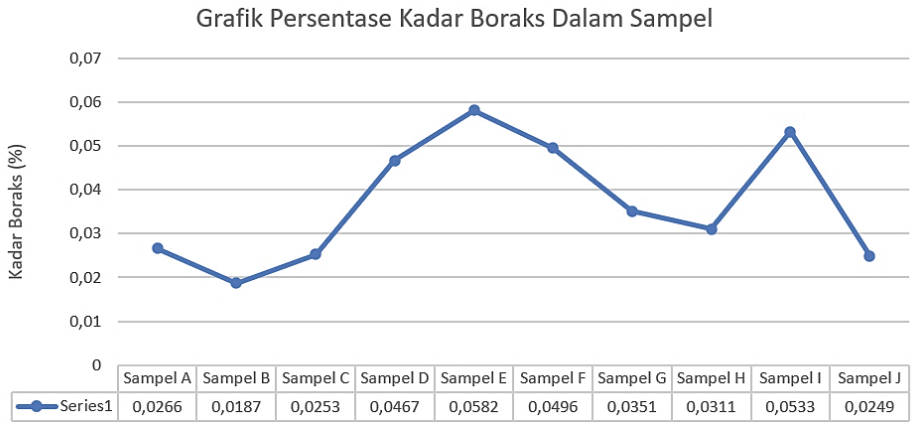


Figure 3. Graph of Percentage of Borax Content in the Sample (Source: Private Collection)

4 Discussion

Meatballs are one type of processed meat food that has been in great demand by all levels of society since ancient times until now. Along with the times and changes trend food, currently meatballs are available in this form frozen food. The main purpose of making frozen food types is to make the food can last a long time. Frozen storage can inhibit the activity of microorganisms and suppress the process of microbial respiration so that inhibition of the growth of microorganisms in food can occur. In addition, food additives are usually added which are combined in frozen storage techniques so that the shelf life of food lasts longer to maintain the physical properties of food and adds aesthetic value (Asiah, 2020). Based on this, it

can be said that food whose quality is maintained in the long term cannot be separated from BTP (Food Additives) mixtures.[21]

Food additives for thickening used are usually STPP (Sodium Tripolyphosphate) with a usage limit of around 0.3% -0.5% which is basically an emulsifying salt group that prevents the separation of fat in food and also a stabilizer group that can stabilize and make food homogeneous. Based on these functions, STPP can also be used as a thickener in food.[22] Other materials that can be used as safe natural thickeners include tapioca flour, carrageenan, and *agar-agar*.[23]

However, not all meatball seller use STPP (Sodium Tripolyphosphate) as a thickener because of the price factor and the lack of knowledge of seller, so often the thickener used is an additive which is prohibited by BPOM (Food and Drug Monitoring Agency). Borax type thickener (Natrium Tetraborate) is included in 19 dangerous food additives that are prohibited from being used by the Ministry of Health and BPOM.[9]

This study aims to determine and compare the levels of borax in meatballs frozen food which are sold in modern markets and traditional markets in Palembang City using a UV-Vis spectrophotometer. The results of this study obtained 10 samples of meatballs from different places, namely 4 meatballs frozen food from the modern market and 6 meatballs frozen food from traditional markets.

The physical test was carried out by comparing the ten samples with a positive control containing borax and a negative control that did not contain borax which the researchers made themselves. A positive control was made by mixing 15 grams of borax into the meatball mixture. This is based on the calculation of the highest dose of borax, which is 10-20 gr/kg for adults and 5-6 gr/kg for children, will cause poisoning and even death. In this amount, if it continues to accumulate in the human body, it can cause cancer and even death.[24] The positive control had a bright color, an unnatural odor, was very chewy and had a rough texture that was difficult to crush, while the negative control that did not contain borax had a pale brown color, a natural odor, was not chewy, and crumbled more easily.

Based on the elasticity parameters, 4 samples with rubbery properties, namely C, E, F, and J, 2 samples with very rubbery properties, namely G and I. Based on the odor parameter, there were 6 samples with unnatural odors, namely samples A, B, F, G, I, and J, which indicates that the meatballs have a mixture of chemicals that affect the aroma of the meatballs. Based on the texture parameters, there were 4 samples that had a hard texture that was difficult to crush, namely samples A, E, F, and G, where this texture was related to the elasticity which showed that meatballs that had a texture that was difficult to crush also had a more chewy texture.

Meatballs whose processing is mixed with borax have a very chewy texture, a lighter color, a more savory taste, and no fishy smell (unnatural smell).[25]

The 10 samples examined met the criteria for the presence of borax contained in the meatball samplefrozen food, which means that based on the physical test 100% of the sample contains borax. Furthermore, a spectrophotometric test was carried out to determine the amount of borax contained. Spectrophotometry is a method used to analyze the taste of a compound qualitatively and quantitatively. The way spectrophotometry works is by looking at the absorbance of chemical compounds using electromagnetic radiation waves so that they become quantities that can be measured, in this case testing of borax compounds in meatball samples is carried out frozen food.[26]

Spectrophotometric test results on 10 meatball samples frozen food have different concentrations with results ranging from 9-29 µg/ml. The sample was measured at a wavelength of 423.50 nm with three replications, then the absorbance results were processed using a linear regression equation to obtain the levels of borax contained. This is in line with research conducted by Suseno (2019) who measured a maximum wavelength value of 428 nm, the results of which are not much different from the results of measurements in the research currently being carried out.[12]

Based on spectrophotometric measurements, the sample that had the lowest borax content was in sample B with a level of 9.392 µg/ml and the highest borax content was found in sample E with a level of 29.127 µg/ml. The concentration of borax in blood serum that can still be tolerated by the body is 7 mg/l or the equivalent of 7 µg/ml, while for toxic doses that can cause borax poisoning is 20-150 mg/l and lethal dose or a dose that can cause death of 200-15000 mg/l.[27, 28]

The measurement results showed that there were 4 samples that had levels above 20 µg/ml, namely in samples C, E, F, I which if consumed continuously could cause health problems and poisoning. After measurements, it was found that all of the samples taken contained borax (100% positive for borax) with 6 samples (60%) having low levels of borax and 4 samples (40%) having moderate levels of borax which were at toxic doses so these foods should not be consumed. may enter the human body because it will cause poisoning and death.

Borax is added to food with the aim of giving a more chewy texture, not easily crushed, and a more savory taste to the meatballs, but this is not justified and it is strictly forbidden to use it in food by the Ministry of Health and BPOM because borax is a dangerous chemical that can harm health. and body functions.[29] Borax that is heated for too long at 100°C will lose one molecule of water and turn into metaboric acid.[30]

Poisoning by borax can be caused if we eat foods that contain borax so that it can cause clinical symptoms that the body can compensate for such as anorexia, digestive tract disorders, respiratory and mild central nervous system disorders such as delirium, hair loss, and anemia. If borax consumption has reached or exceeded the maximum toxic dose limit, it will result in clinical manifestations such as nausea and vomiting, diarrhea, dyspnea, epigastric pain, malaise, gastrointestinal bleeding accompanied by hematemesis and severe headaches and can even cause death if consuming borax in lethal doses.[5]

The results of sample measurements in this study based on each sample taken in modern markets and traditional markets do not have a significant difference. Meatball samplesfrozen food which are taken from modern markets and traditional markets are proven to still contain borax in them. The facts that the researchers found in the field during the research showed that these findings were a form of non-compliance with Law Number 18 of 2012 concerning Food.[31] The law implied a message that business actors, both producers and market managers, pay attention to every product sold, such as the threshold for BTP use, types of BTP that are safe for consumption, food sanitation, food quality and safety, as well as standardized food packaging.

Modern market managers have special policies and regulations to maintain the quality and quality of the products sold in order to further tighten the process of sorting goods that will enter the supermarket so that the food products sold are truly safe, because the current societal stigma considers that every food ingredient sold in the modern market is gated.[32]

In this study, four out of ten meatball samples taken at the modern market were packaged using plastic wrap and some were wrapped in plastic without a label. Three samples from traditional markets were packaged using nylon PE plastic(polyethylene) which was vacuumed and only given a name tagbrand meatballs, without production code, BPOM permit number, halal certificate, and composition used for making meatballs. Two samples from traditional markets were only packaged using kilo plastic tied with rubber without any labels. One sample obtained from a traditional market is packaged using specially designed plastic food packaging that meets the requirements for good food packaging, on the packaging is the brand name, meatball composition, serving method, storage method, description of net weight, name of producer's social media account, but not equipped with production code, dateexpired, barcode, and do not yet have a distribution permit from BPOM.

Packaging is a component that functions as a food protector and as an attraction for consumers. Manufacturers are required to use safe packaging such as polymer plastic (polyetthylene), go green, include the food tare and recycling logo, halal logo, product label, P-IRT registration number and BPOM permit number, food product expiration date, and composition information on food packaging. Specifically for vacuum packaging with an airtight condition in the package,

the damage caused by oxidation can be eliminated so that the freshness of the packaged product will last 3 – 5 times longer.[33]

5 Conclussion and Suggestion

In this study it can be concluded that based on qualitative analysis by means of physical tests and quantitative analysis using UV-Vis spectrophotometry, the results obtained that all samples contained borax. The difference from meatballs frozen food which are sold in modern markets and traditional markets are not significant both from physical tests and spectrophotometric tests because the results vary.

Therefore, suggestions for further research are expected to be able to increase the number of samples and use different research methods and in future studies to test the activity of borax on antibacterial or antifungal properties in vitro and toxicity tests of animal in vivo.

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