



Microbiological Quality Test of Food at Market Restaurant in Gorontalo City Market

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<p>Track Record Article</p> <p>Accepted: 03 April 2023 Revised: 14 June 2023 Published: 20 December 2023</p> <p>How to cite : Rahim, E., & Suleman, R. (2023). Microbiological Quality Test of Food at Market Restaurant in Gorontalo City Market. <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 5(4), 1309–1317.</p>	<p style="text-align: center;">Abstract</p> <p><i>Market food is very popular with the people of Indonesia because the price is very affordable, tastes good and has many variations. However, market food processing often ignores cleanliness starting from the processing process to the presentation so that it can cause food to be contaminated with Escherichia coli and Salmonella sp. bacteria. Food contaminated with bacteria if consumed can harm digestion so it can also cause diarrhea. The growth of these microbes can cause food to spoil making it unfit to eat and cause poisoning in humans and even death. This study aims to examine the quality of food from microbiological exposure. This research is an experimental study using the cup count method or the pour method to analyze the microbiological quality of food ingredients with 16 samples, namely Block 8 and Block 11 in the Central Market of Gorontalo City conducted from September to October 2020. Based on the test results with 3 repetitions at different times, it was obtained that samples that did not meet the requirements were in Block 8 RM 2 in the form of woku fish, and in Block 11 there were RM 1, namely chicken curry and RM 2, namely fried fish.</i></p> <p>Keyword: Bacteria, Escherichia coli, Food Market, Salmonella sp</p>
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INTRODUCTION

Until now, market food is still in great demand by the public, not because of its affordable prices, but also because of the various flavors and types that are easily available in every corner of the market (Verawati et al., 2019). Even though instant and modern food has been circulating and even imported from abroad, market snacks are still popular with the public for several reasons, among others because the prices are relatively affordable with good taste, and there are many choices of various types available (Ilahi et al., 2021).

In general, the market is a place that sells food for daily needs. According to Government Regulation No. 28 of 2004 concerning Food Quality and Nutrition Safety, it expressly states that everyone who is responsible for organizing activities in the food chain which includes the process of production, storage, transportation and distribution of food must comply with sanitation requirements in accordance with statutory provisions (Salawati et al., 2020). So if the market conditions do not meet the sanitation requirements for environmental health, in this case unhealthy, it will increase the risk of transmission of environment-based diseases. According to the Environmental Health Engineering and Disease Control Agency, a healthy market is a market condition that is clean, safe, comfortable and healthy, which is

realized through the cooperation of related units in the market in providing safe, nutritious food for the community (Jimin et al., 2021).

Food has a very important meaning in human life, apart from providing the nutrients needed for growth and a source of energy, food can also provide the substances needed to support a healthier body. Therefore, to improve human life, it is necessary to have adequate food supplies both in terms of quality and quantity. In terms of quality, in addition to containing all the nutrients needed by the body, food must also meet food safety requirements (Amalia F et al., 2019). Safe food is a very important factor to be able to improve one's health status. In RI Law no. 7 of 1996 concerning food, food safety is defined as the conditions and efforts needed to prevent food from the possibility of chemical, biological contamination, other objects that can interfere, harm and endanger human health (Christiva et al., 2020).

Coliform and Salmonella sp are often used as the main standards for food hygiene in the industry. This is because in excessive amounts these two bacteria can reduce the quality of food products and harm consumers because they will cause disease, especially digestive disorders. The existence of Coliform and Salmonella sp shows that there is a lack of hygiene and sanitation levels in the food processing industry, especially small industries (Molita et al., 2019). Hygiene and sanitation are closely related to microbial contamination of food. Bacterial contamination in food usually comes from raw materials, processing personnel and food processing. Parameters of damage to tofu caused by the presence of microbes that cause spoilage, namely Coliform bacteria and Salmonella sp which can cause a foul odor, sour taste, and mucus (Jimin et al., 2021).

Based on the World Health Organization (WHO), the common pathogens that cause foodborne disease in Southeast Asia are Novovirus, Salmonella sp., and pathogenic Escherichia coli. Of the three pathogens, Salmonella sp. and Escherichia coli are microorganisms that belong to the group of bacteria. Novovirus belongs to a class of viruses which are obligate parasites. Every year, more than 150 million people in Southeast Asia are exposed to foodborne diseases with a mortality rate of more than 175 thousand (0.1167%). Of these sufferers, 60 million of them are children with 50,000 child deaths (Krismaningrum & Rahmadhia, 2023). Supervision of ready-to-eat food and home industry as well as school children's snacks (PJAS) found various contaminants in food. In 2011, 4808 samples of school children's snacks were also tested for microbial contamination test parameters, with the results: 789 (16.41%) samples contained ALT exceeding the maximum limit, 570 (11.86%) samples containing Coliform bacteria exceeding the limit maximum, 253 (5.26%) samples contained a mold-yeast rate exceeding the maximum limit, 149 (3.10%) samples contaminated with E.coli, 18 (0.37%)

samples contaminated with *S.aureus* and 13 (0.27) % samples contaminated with *Salmonella* (Rahmadani et al., 2023).

It is very important to determine the quality of fresh fish and processed fish through microbiological tests to determine the quality and safety of the product so that it can prevent food poisoning due to contamination by pathogenic bacteria or food borne disease (FBD) caused by microbes entering the body with food (Razali et al., 2018). Microbiological contamination in food needs to be analyzed to determine food safety, for this reason this study aims to examine the microbiological quality of food sold in traditional markets.

METHODS

The microbiological analysis carried out was the determination of the Total Plate Count, *E. coli* and salmonella. Calculation of Total Plate Count was carried out on market food samples using the cup counting method based on SNI 7388-2009. That the pouring method is a technique for growing microorganisms in agar media by mixing still liquid agar with bacterial culture stock (agar) so that the cells are spread evenly and remain either on the surface of the agar or inside the agar. In the pouring method, a sample amount (1 ml or 0.1 ml) of the desired retail is put into a petri dish, then 15-20 ml of cooled sterile liquid agar is added (47-50°C) and shaken so that the sample spreads. In fertilization using the surface method, an agar cup is first made, then as much as 0.1 ml of the diluted sample is pipetted onto the surface of the agar, then flattened with a sterile curved glass rod.

The number of research sampling points is located in two blocks of the Gorontalo City Central Market, namely Block 8 and Block 11 which are designated as restaurant locations by market managers. Of the two blocks, Block 8 has the most restaurants, namely 5 restaurants, while Block 8 only has 2 restaurants. This number has decreased from the previously reported number of 16 restaurants. Some restaurants have not been actively selling and the reason is not known. The types of samples tested by the researchers were in the form of processed fish and meat which the time of sampling was carried out 3 times, each of which was carried out on a different day. Sampling was carried out at 12.30 WITA because it coincided with lunch time where samples were obtained after people bought and ate at the restaurant location. Food samples were brought to the laboratory using a tightly closed sterile container and then put in a closed box. This research was conducted from September to October 2020. This research has received a Health Research Ethical Eligibility Statement Number: PE/054/III/2023/KEP/SHT.

The number of colonies (total plate number/ALT) in the sample can be calculated using the formula (Waluyo, 2010), as follows:

$$ALT = \frac{\text{Total of Colonies} \times \text{Dilution factor (CFU/ml or CFU/gr)}}{\text{Planted volume}}$$

Reports of the results of counting by means of cup counts using a standard called the Standard Plate Counts (SPC).

RESULTS

Based on research using the TPC method that has been carried out on various types of food from restaurants within the Gorontalo City Central Market, the total number of bacterial colonies is obtained as follows:

Table 1. results of food testing using the Total Plate Count (TPC) Method

Block Central	Restaurant code	Sample	Samplin g time	Total of Colonies Bacteria			Total of colonies (colonies/gram)	Information	
				10 ¹	10 ²	10 ³			
Block 8	RM1	Acar daging sapi	Day 1	182	40	6	1,8x10 ³	MS	
			Day 2	112	11	8	1,1 x10 ³	MS	
			Day 3	223	31	15	2,7 x10 ³	MS	
		Rendang	Day 1	248	43	33	4,0 x10 ⁴	MS	
			Day 2	297	83	5	3,0 x10 ³	MS	
			Day 3	272	61	26	2,7 x10 ³	MS	
	RM2	Tumis ikan	Day 1	49	34	0	0,5 x10 ³	MS	
			Day 2	110	19	1	1,1 x10 ³	MS	
			Day 3	TBUD	19	4	1,9 x10 ³	MS	
		Ikan goreng	Day 1	21	5	0	0,2 x10 ³	MS	
			Day 2	11	3	1	0,1 x10 ³	MS	
			Day 3	100	49	2	1,0 x10 ³	MS	
		Ikan woku	Day 1	TBUD	TBUD	502	5,0 x10 ⁵	TMS	
			Day 2	TBUD	TBUD	271	2,8 x10 ⁵	MS	
			Day 3	TBUD	TBUD	524	5,2 x10 ⁵	TMS	
		Ikan Bakar	Day 1	8	2	1	0,8 x10 ²	MS	
			Day 2	12	0	0	0,1 x10 ³	MS	
			Day 3	10	3	0	0,1 x10 ³	MS	
	RM3	Ayam goreng	Day 1	TBUD	25	0	2,5 x10 ³	MS	
			Day 2	322	0	0	3,2 x10 ³	MS	
			Day 3	40	11	0	0,4 x10 ³	MS	
		Ikan goreng	Day 1	TBUD	141	12	1,4 x10 ⁴	MS	
			Day 2	78	63	9	0,8 x10 ³	MS	
			Day 3	90	2	0	0,9x10 ³	MS	
RM4	Ayam goreng	Day 1	120	54	0	1,2 x10 ³	MS		
		Day 2	51	9	1	0,5 x10 ³	MS		
		Day 3	119	5	2	1,2 x10 ³	MS		
	Ikan teri goreng	Day 1	36	4	2	0,4 x10 ³	MS		
		Day 2	11	3	1	0,1 x10 ³	MS		
		Day 3	7	1	0	0,7 x10 ²	MS		
RM5	Ikan goreng	Day 1	29	4	1	0,3 x10 ³	MS		
		Day 2	40	2	1	0,4 x10 ³	MS		
		Day 3	17	3	0	0,2 x10 ³	MS		
	Cumi kuah hitam	Day 1	30	4	3	0,3 x10 ³	MS		
		Day 2	115	10	1	1,2 x10 ³	MS		
		Day 3	71	3	1	0,2 x10 ³	MS		
	Ikan goreng	Day 1	9	1	0	0,9 x10 ²	MS		
		Day 2	1	1	0	0,1 x10 ²	MS		
		Day 3	2	1	1	0,2 x10 ²	MS		
	Block 11	RM1	Ikan goreng	Day 1	135	29	0	1,4 x10 ³	MS
				Day 2	TBUD	TBUD	412	4,1 x10 ⁵	MS
				Day 3	163	29	7	1,6 x10 ³	MS
Kari ayam			Day 1	TBUD	TBUD	782	3,5 x10 ⁵	TMS	
			Day 2	173	6	2	1,7 x10 ³	MS	
			Day 3	TBUD	TBUD	356	3,6 x10 ⁵	TMS	
RM2		Ikan kuah	Day 1	TBUD	35	6	3,5 x10 ³	MS	
			Day 2	TBUD	34	9	3,4 x10 ³	MS	
			Day 3	TBUD	53	13	5,3 x10 ³	MS	
		Ikan goreng	Day 1	TBUD	TBUD	800	8,0 x10 ⁵	TMS	
			Day 2	TBUD	TBUD	786	7,9 x10 ⁵	TMS	
			Day 3	TBUD	TBUD	846	8,5 x10 ⁵	TMS	

Information:

RM is a restaurant

S1, S2 and so on are the first sample, the second sample and so on
TBUD is the number of colonies that cannot be counted
MS is eligible
TMS is not eligible

Based on the test results by repeating 3 times at different times, the above data was obtained where it was found that several food samples were dominated by foods that still met the requirements, while others did not meet the requirements. The samples that did not meet the requirements were at Block 8 RM 2 in the form of woku fish, and in Block 11 there were RM 1, namely chicken curry and RM 2, namely fried fish. The basis for determining eligibility and non-eligibility for consumption is based on Regulation of the Head of BPOM RI Number HK.00.06.1.52.4011 Concerning Maximum Limits for Microbial and Chemical Contamination in Food Year 2009.

DISCUSSION

Samples that have total microbes that exceed the maximum threshold for microbial contamination are caused by various factors, both factors from the type of sample, handling factors, facilities, and the environment. What is meant by "type of sample" is the type of food served plus the nutrient content of the sample in a humid condition, which is a factor that can affect the growth of microorganisms in food. These nutrients are used as a source of energy. Foods that contain carbon, nitrogen, vitamins and minerals are good nutrients for microbial growth. Types of food that are proven to be very at risk of contamination are types of food in the form of soupy foods (containing water), while it is known that bacteria really need water for their growth and development.

Basically, cooked food should be served for immediate consumption with the aim of avoiding bacterial contamination which will come with the food to enter and interfere with the body's health (Amalia et al., 2022). If the food is still stored for certain needs, you should pay attention to the container and its cleanliness, the cleanliness of the food processor and the cleanliness of the environment around the restaurant. In this case, the restaurant is one of the commercial food businesses, so it does a certain amount of cooking and storage for the next few hours (Nuraini et al., 2021).

One of the causes of bacterial contamination in food in the Gorontalo City Central Market is contamination by E. coli bacteria based on food ingredients and type of food (Razali et al., 2018). The food samples that were not contaminated were made from meat while those that were contaminated were those made from fish. The type of food itself that is not contaminated is a type of dry food while the type of food that is contaminated is a type of food

that is gravy (Amsal et al., 2019). In addition, food storage from the food itself has a risk of contamination of bacteria into the food, namely in the form of food that is served in a buffet manner and is no longer served hot (Rahadyan et al., 2023). Moreover, all the locations of restaurants are next to the lanes of vehicles entering or leaving the market. Contamination of *E. coli* in food at the Gorontalo City Central Market is influenced by various factors (Aida & Mandang, 2022).

Food is one of the determining factors for contamination, because food is a good medium for the growth of various microorganisms (Maya et al., 2023). Physically, meat or fish at temperature conditions of 7oC to 60oC is the optimum condition for the growth and development of bacteria so that it can cause changes in terms of appearance, taste, smell, and properties of food ingredients (Nasution, 2020). Contamination caused by food handlers is known as cross-contamination, in this case, the restaurant food processor itself. Food processors are actors in the effort to provide healthy food (Rahmadani et al., 2023). This is because food handling plays a role in transmitting bacteria originating from itself, especially food processors who pay less attention to personal hygiene (Fatiqin et al., 2019).

The way of serving food is done in a buffet manner with the condition that the food is not hot enough to allow contamination of bacteria in the air to settle on the food (Utami et al., 2023). Air is basically not a place for the growth and reproduction of bacteria because the composition of the air is not suitable (Hasanah et al., 2023). In the open air, most bacteria come from the soil (Sulastri et al., 2022). The presence of bacteria in the air may be carried by dust, moisture, wind and droplets. The bacteria are spread by droplets expelled by the nose or mouth during coughing, sneezing and talking (Salawati et al., 2020). Even though the chance is small, the impact is huge (Krismaningrum & Rahmadhia, 2023). As long as there is activity in the room, dust will still float due to air circulation (Pramono et al., 2020).

Salmonella bacteria sp. is one of the pathogenic bacteria found in the tested food samples. These bacteria generally grow in conditions of 4-45oC (Suarti et al., 2016). Even though the food served has been cooked using temperatures above 45oC, these bacteria are still found in the food (Dewi & Irma, 2023). Thus it can be ascertained that the bacterial contamination originates from external factors including food handlers and environmental factors (Christiva et al., 2020).

As with the *E. coli* contamination factor from food handlers, it is the same with *Salmonella* bacteria contamination. Food handlers have a role in the contamination of the food served (Amalia et al., 2022). Broadly speaking, hygiene and sanitation is the cause (Mailoa et al., 2019). *Salmonella* bacteria spread widely in the environment, where they are generally

carried by flies or flying dust that land on food, coupled with hot and humid conditions, allowing Salmonella to reproduce quickly (Verawati et al., 2019). Even so, increasing the number of Salmonella bacteria in a food does not always cause changes in terms of color, smell, or taste of the food so that indirectly the occurrence of contamination cannot be known by eye observation, but is done through laboratory tests (Fatimah et al., 2022).

Ideally, a restaurant should be located in an area free of dust, smoke, odors, away from landfills and free from insects in the form of flies which are carriers of microbes in food (Nasution, 2020). But the fact is that all restaurants are close to the road so that the condition becomes dusty (Amalia F et al., 2019). In addition, the presence of bacterial colonies found in samples was influenced by environmental conditions which strongly supported the growth of bacteria in the restaurant location within the Gorontalo City Central Market. The following is the result of measuring the environmental conditions of each restaurant (Amsal et al., 2019).

CONCLUSIONS

Based on the test results by repeating 3 times at different times, it was obtained that samples that did not meet the requirements were in Block 8 RM 2 in the form of woku fish, and in Block 11 there were RM 1, namely chicken curry and RM 2, namely fried fish. The samples did not meet the requirements due to unhygienic food handlers and the processing carried out did not meet the requirements related to processed food safety, as well as the presentation of open food so that it would be easier for microbiological contamination to occur. It is better for future researchers to add variables related to food handlers and measure environmental conditions such as humidity, lighting which will contribute to microbiological contamination.

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