

Research Article

Detection of Bacterial Contaminants and Identification of *Salmonella* Sp. in Cilok Snack in Selaparang District, Mataram

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Abstract: Cilok is a boiled snack made from starch with or without a mixture of minced meat, and has a savory and chewy taste. Cilok is one of the favorite snacks in Indonesia. Most cilok sellers sell their cilok right on the side of the main road for hours. This allows cilok that are sold to be contaminated with various bacteria. This study aims to calculate the Total Plate Count (TPC) of bacteria and to identify *Salmonella* sp. in cilok and its sauce in Selaparang District, Mataram City. This study used a quantitative method in the form of calculating the TPC of the bacteria and a qualitative method in the form of sample isolation on selective media, sugar, and biochemical tests. The results of this study showed that the TPC of the bacteria from the cilok sellers samples number 1 to 8 were $1,2 \times 10^2$, 1×10^1 , 1×10^1 , 2×10^1 , $1,2 \times 10^2$, $1,5 \times 10^2$, $3,9 \times 10^1$, and $3,5 \times 10^2$ cfu/g respectively. Meanwhile, the TPC of the bacteria from sellers' sauce samples number 1 to 8 were 2×10^2 , $1,8 \times 10^3$, 1×10^1 , 1×10^1 , $1,5 \times 10^1$, $7,9 \times 10^3$, $1,7 \times 10^5$ and $1,7 \times 10^3$ cfu/mL, and there was no contamination of *Salmonella* sp. on cilok nor its sauce samples. All the cilok samples that had been examined had TPC bacterial values that did not exceed the standards set by SNI 7388-2009, so they were still safe for consumption. Meanwhile, one out of eight sauce samples had a bacterial TPC value that exceeded the standard, making it not safe for consumption.

Keywords: Cilok, *Salmonella* sp., TPC, identification, Selaparang District

INTRODUCTION

Cilok is a snack made from starch with or without a mixture of minced meat that is boiled, with a savory and chewy taste. Cilok is a processed food that is in great demand today and is one of the favorite snacks in Indonesia. Most cilok vendors sell their wares right on the side of the highway for a long time. This allows the cilok sold to be contaminated by various bacteria. Consuming food contaminated with bacteria can cause food borne diseases such as Salmonellosis and Botulism [10].

Salmonella is one of the bacteria that cause food-borne diseases that often contaminate eggs, fish, meat, milk and processed products. *Salmonella* in food in high numbers does not cause changes in the color, smell or taste of the food. *Salmonella* that enters the body will cause a disease called salmonellosis [3,9]. The Indonesian National Standard has set a maximum limit for bacterial contamination in food. Processed mashed meat products have a maximum limit of total bacterial plate numbers, which cannot exceed 1×10^5 CFU/g and are negative for *Salmonella*



sp. bacteria, while the maximum limit of total bacterial plate numbers for sauces is 1×10^4 CFU/g [11].

Based on an initial survey conducted by researchers in Selaparang District, Mataram City, obtained 8 cilok vendors who sell their wares right on the edge of the highway. There are several cilok traders who do not store and sell their merchandise in warm conditions. Food storage at inappropriate temperatures such as ambient temperature for a long time, can facilitate the growth of bacteria. Research on the identification of *Salmonella* sp. in cilok has been done in the elementary school neighborhood of Kekalik Village, Sekarbela Subdistrict, Mataram City [4], but the research was limited to identify *Salmonella* sp. in cilok without examining the sauce that is a mixture of cilok.

Data on bacterial contamination and identification of *Salmonella* sp. in cilok snacks and their sauces in Mataram are still very few. Therefore, research on bacterial contamination and identification of *Salmonella* sp. in cilok snacks in Selaparang District, Mataram City needs to be done.

METHOD

Sampling

Sampling in the study was carried out by buying cilok sold by cilok vendors in Selaparang District, Mataram City. From each of these traders purchased a portion of cilok and cilok sauce to taste separated with the cilok.

Total Plate Count (TPC)

This test was carried out by weighing a sample of 10 g and mashed using a mortar. Then, the mashed sample was dissolved into 90 mL of 0.9% sterile NaCl solution and then shaken with a vortex until homogeneous. A total of 1 mL of sample dilution was taken and serial dilution was carried out to obtain dilution of 10^{-1} , 10^{-2} , 10^{-3} , 10^{-4} and 10^{-5} . Furthermore, 0.1 mL of suspension from each dilution was put into a Petri dish, then liquid NA as much as 15 to 20 mL was poured aseptically into each cup [5].

Isolation of *Salmonella* sp.

Isolation of *Salmonella* sp. consists of three stages, namely pre-enrichment, enrichment and isolation, respectively. The pre-enrichment stage was carried out by weighing 25 g of cilok sample and crushed using a mortar. Furthermore, the crushed sample was put into 225 mL of Lactose Broth solution, then shaken until homogeneous and incubated for 24 hours at 37°C. The enrichment stage is carried out by taking 1 mL of samples that incubated previously in pre-enrichment, then put into 10 mL of SCB solution and incubated for 24 hours at 37°C. The isolation stage is carried out by taking one loop of sample from SCB and streaking it on SSA media, then incubated for 24 hours at 37°C. After incubation *Salmonella* sp. will form clear colonies with a black color in the colony center [6].

Identification of *Salmonella* sp.

Identification of *Salmonella* sp. is done by several stages, namely gram staining, sugar and biochemical tests. The sugar test consists of glucose, sucrose and lactose tests, while the biochemical test consists of TSIA, SC, MR, VP, Urea, Indole and Motility tests.

Data Analysis

Data analysis of the calculation of total plate count (TPC) of bacteria and identification of *Salmonella* sp. bacteria in cilok and sauce samples was compared to SNI 7388-2009 concerning the standard limit of microbial contamination in food.

**RESULTS AND DISCUSSION**

From all the cilok samples examined, all showed bacterial growth. Each colony that grows on NA media is counted to determine the number of colonies in each sample. Based on the calculations carried out, the results obtained from all cilok samples in this study have a bacterial TPC value below the maximum acceptable threshold. The TPC value of bacteria obtained in each cilok sample can be seen in Table 1.

Table 1. Total Plate Count (TPL) of cilok from some vendors in Selaparang, Mataram

Sample Name	Bacterial Concentration (CFU/gram)	Maximum Threshold	Results
P1	$1,2 \times 10^2$	1x10 ⁵ CFU/gram	Meets the requirements
P2	1×10^1		Meets the requirements
P3	1×10^1		Meets the requirements
P4	2×10^1		Meets the requirements
P5	$1,2 \times 10^2$		Meets the requirements
P6	$1,5 \times 10^2$		Meets the requirements
P7	$3,9 \times 10^2$		Meets the requirements
P8	$3,5 \times 10^2$		Meets the requirements

The results of the calculation of bacterial TPC in sauce samples obtained one of eight samples had TPC values exceeding the maximum acceptable threshold. The results of the calculation of bacterial TPC obtained in each sauce sample can be seen in Table 2.

Table 2. Total Plate Count (TPL) of cilok sauce from some vendors in Selaparang, Mataram

Sample Name	Bacterial Concentration (CFU/gram)	Maximum Threshold	Results
P1	2×10^1	1x10 ⁴ CFU/mL	Meet the requirement
P2	$1,8 \times 10^3$		Meet the requirement
P3	1×10^1		Meet the requirement
P4	1×10^1		Meet the requirement
P5	$1,5 \times 10^1$		Meet the requirement
P6	$7,9 \times 10^3$		Meet the requirement
P7	$1,7 \times 10^5$		Does not meet the requirement
P8	$1,7 \times 10^3$		Meet the requirement

Based on the results of this study, all cilok samples were still safe for consumption because they still met the standards of the maximum limit of microbial contamination in food in SNI 7388-2009, namely 1×10^5 CFU/g, while in the sauce sample it was found that one of the eight sauce samples had a bacterial count exceeding the standard maximum limit of the number of bacteria set by SNI 7388-2009, namely sauce sample P7 with a bacterial count of 1.7×10^5 CFU/mL (the maximum limit of microbial contamination in food in SNI 7388-2009 is 1×10^4 CFU/mL). This indicated that the P7 sauce sample is not safe for consumption.



Based on the above results, the TPC value in cilok samples that did not exceed the contamination limit can be caused by most cilok sold in hot conditions. This is in accordance with the research of [12] that the results of the total plate number of bacteria that meet the requirements in the sample are caused by bacteria that have died during the boiling process. However, the safety of cilok snacks is not only seen from the cilok, this is because consumers usually consume cilok along with the sauce. Bacteria in the sauce can originate from the use of poor basic ingredients for preparing the sauce [10]. These results were also supported by research done by [7] that three of the ten tomato sauce samples examined from traditional snacks were not suitable for consumption because they exceeded the bacterial contamination threshold set by SNI 7388-2009.

Another cause of high tomato sauce contamination is sauce containers that are rarely cleaned and often left in open conditions. The high contamination of sauce samples can be caused by the vendor's lack of knowledge about hygiene and sanitation of the handler, both during processing, storage and serving [13].

The results of *Salmonella* sp bacterial isolation presented in Table 3 showed the presence of bacterial colonies that grow on cilok and sauce samples P7. Colonies grew on samples of cilok and sauce P7 were round and pink in color as seen in Figure 2. Based on these characteristics, the colonies that grew were not characteristic of the colony of *Salmonella* sp. bacteria.

Table 3. Isolation results on SSA medium

Sample Name	Sample Type	Colony grew in SSA medium	<i>Salmonella</i> sp.
P1	Cilok	No colony grew	-
	Cilok sauce		
P2	Cilok	No colony grew	-
	Cilok sauce		
P3	Cilok	No colony grew	-
	Cilok sauce		
P4	Cilok	No colony grew	-
	Cilok sauce		
P5	Cilok	No colony grew	-
	Cilok sauce		
P5	Cilok	No colony grew	-
	Cilok sauce		
P6	Cilok	No colony grew	-
	Cilok sauce		
P7	Cilok	Pink colony	Not <i>Salmonella</i> sp.
	Cilok sauce		
P8	Cilok	No colony grew	-
	Cilok sauce		

These results are in accordance with the standard determined by SNI 7388-2009 that *Salmonella* sp must be negative in every 25g sample. The absence of *Salmonella* sp. bacterial contamination in cilok samples can be due to the fact that the bacteria have died during the heating process with high temperatures [8]. In addition, a good production process, by cooking food thoroughly, using clean water, and good hygiene during food production significantly reduces the risk of *Salmonella* sp. contamination.

Based on table 3, from the eight cilok vendor samples tested, there was one vendor sample that was grown by bacterial colonies. Bacterial colonies grew on the cilok and also sauce sample from vendor number 7. Colonies that grow on SSA media were pink in color as seen in Figure 1.

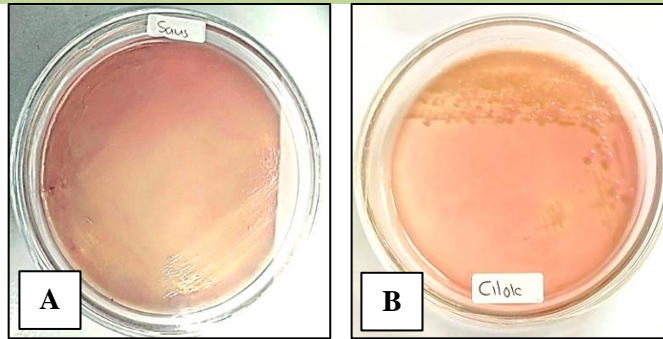


Figure 1. Bacterial colonies grown on SSA media, A: Sauce; B: Cilok

The presence of bacterial contamination in food can originate from internal sources (from within the food itself) and external sources where food will be exposed to the environment from the time it is cooked until it is consumed. The types and numbers of bacteria that come from these various sources vary greatly depending on the level of sanitation during food processing [1,2]

CONCLUSIONS

The research concluded that understanding personal hygiene for cilok vendors plays an important role in preventing bacterial contamination of cilok so as to improve the quality and safety of cilok for consumers. In addition, it is important to pay attention to the cleanliness of the equipment used when selling, especially on sauce equipment, which if this is not considered, can endanger consumers in consuming the sauce used in cilok.

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