



Analysis of Most Probable Number (mpn) of Coliform Bacteria and Fecal Coli on Coconut Ice Sold in Makassar

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Abstract

Young coconut ice is refreshing drink liked by most of people. This coconut drinks are sold in the suburban road of Pettarani Makassar City, South Sulawesi, Indonesia Young coconut ice is a traditional drink that is very popular by the public. And very easy to be contaminated by *Escherichia coli*, if the processing is not hygiene. To determine the amount of *Escherichia coli* and Coliform in the sample using the MPN test (Most Probability Number) as estimation number of individual bacteria. The MPN method has a 95% confidence limit on every MPN value. The unit used is generally per 100 ml or per gram. This examination has been carried out at the Health Analyst Laboratory and Health Laboratory of Makassar on August 2 to October 28, 2016. The purpose of this study is to determine the number of Most Probable Number (MPN) Coliform bacteria and fecal Coli on coconut ice sold in Makassar City. This type of research is a descriptive laboratory observation to find out the number of coliform and fecal coli on coconut ice sold in Makassar City. The number of samples in this study were 30 taken by cluster sampling. This examination is carried out in two stages: the examination of the number of coliform and *Escherichia coli*. The results showed that the number of MPN Coliform in young coconut ice sold in Makassar is above the maximum limit of contamination according to Indonesian National Standard (SNI) that is (100%) and 10 samples (33.33%) are contaminated with *Escherichia coli* (none eligible health according to SNI). Health Department suggested to provide counseling about the importance of maintaining hygiene and contamination by microbes for the community to avoid the resulting illness.

Keywords: Coconut Ice; Coliform Bacteria; Fecal Coli Bacteria.

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1. Introduction

Young coconut ice is a refreshing drink that is liked by most of people. This drink is suitable consumed to release thirst, especially when the weather is scorching. The raw materials are still fresh and without preservatives. Coconut ice drinks are sold on the suburban road of Pettarani Makassar. The young coconut ice is a traditional drink that is very popular with the public. And very easily contaminated by *Escherichia coli*, if the way of processing is not hygiene [1,2]. The indicator of water contamination by pathogenic bacteria causing food contamination disease is fecal coliform bacteria. Fecal coliform bacteria is a group of gram-negative bacteria that is aerobic and facultative anaerobes, rod-shaped, has no spores, and is a normal flora of human digestive tract, for example *E. coli*. Tea beverages contaminated with coliform and fecal coliform bacteria can cause various diseases for humans, e.g. diarrhea by *E. coli* bacteria, typhoid caused by *Salmonella Typhosa*, bacillary dysentery caused by *Shigella Dysenteriae* bacteria and cholera disease caused by *Vibrio Cholera* bacteria [3,4]. MPN is an enumeration technique in microbial (in this case fecal coliform), on a liquid material. The MPN method consists of three stages, namely the presumptive test, confirmed test, and completed test. In the first-stage test, the presence of coliform is still in a low probability level; still in conjecture. The organisms for the feasibility of water consumption or liquid food ingredients are groups of coliform bacteria: *Escherichia*, *Enterobacter* and *Klebsiella* species. Ice drinks (mixed ice, cincau ice, and young coconut ice) are potential to transmit disease [5,6].

2. Materials and Methods

2.1 Location and time of study

The research location is Microbiology Laboratory of Health Analyst of Health Polytechnic Makassar and Health Laboratory of Makassar

2.2 Research Design

The type of this research is descriptive observation that is to know the number of coliform and fecal coli on coconut ice sold in Makassar City.

2.3 Population and sample

a. Population

The population in this study is a number of coconut ice sold in Makassar

b. Sample

The sample in this research is coconut ice sold in Makassar city

2.4 Data Analysis

The data obtained were reported in the percentage of positive amounts after being read in the coliform MPN table expressed in the number of bacteria / 100ml. And the positivity of coliform and fecal coli found.

3. Results

Data indicated (Table 1-4) that none of the samples fulfill the requirement to be consumed with MPN oli value above 100 ml per sample and there are 2 samples found fecal coli.

Table 1: Inoculation Result in Lactose Media Broth and Escherichia Broth

Sample Code	INTRODUCTION TEST			CONFIRMATION TEST			MPN VALUE of Coliform/100 ml
	LB 37 ⁰ C 2X24 HOURS			EC 37 ⁰ C 2X24 HOURS			
	10 ml	1 ml	0,1 ml	10 ml	1 ml	0,1 ml	
Sample 1	3/3	3/3	3/3	2/3	2/3	-	21
Sample 2	3/3	3/3	3/3	2/3	2/3	1/3	28
Sample 3	3/3	3/3	3/3	3/3	2/3	-	93
Sample 4	3/3	3/3	3/3	3/3	3/3	3/3	>1100
Sample 5	3/3	3/3	3/3	3/3	3/3	3/3	>1100

Table 2: Observation Results on EMBA and Gram Staining

Sample Code	EMB Media Agar			Pew Gram		
	Color	Colony Surface	Colony Suburbs	Colony Size	Cell Shape	Gram Type
Sample 1	Metallic green	Convex	smooth	Small	Bacillus	Negative
Sample 2	Metallic green	Convex	Smooth	Medium	Bacillus	Negative
Sample 3	Metallic green	Convex	Smooth	Medium	Bacillus	Negative
Sample 4	Metallic green	Convex	smooth	Small	Bacillus	Negative
Sample 5	Metallic green	Convex	Smooth	Medium	Bacillus	Negative

Table 3: Inoculation Results in TSIA Media (Triple Sugar Iron Agar)

Sample Code	Medium TSIA (Triple Sugar Iron Agar)			
	Slope	Base	Gass	H ₂ S
Sample 1	Acid	Acid	Positive (+)	Negative (-)
Sample 2	Acid	Acid	Positive (+)	Negative (-)
Sample 3	Acid	Acid	Positive (+)	Negative (-)
Sample 4	Acid	Acid	Positive (+)	Negative (-)
Sample 5	Acid	Acid	Positive (+)	Negative (-)

Table 4: Results of MPN Coliform and Fecal Coli at Several Locations

Location : AP Pettarani Street (Code 1-8) Sultan Alaudin street (Kode 9-10)		
Sample Code	MPN Coliform/100ml	MPN E Coli/100ml
Coconut Ice (1)	1100	1100
Coconut Ice (2)	1100	1100
Coconut Ice (3)	1100	0
Coconut Ice (4)	1100	3,5
Coconut Ice (5)	1100	0
Coconut Ice (6)	1100	0
Coconut Ice (7)	1100	0
Coconut Ice (8)	1100	0
Coconut Ice (9)	1100	0
Coconut Ice (10)	1100	0
Location : Hertasing Baru Street (Code 1-3) and Fort Rotterdam (Code 4-10)		
Coconut Ice (1)	240	15
Coconut Ice (2)	1100	93
Coconut Ice (3)	1100	0
Coconut Ice (4)	240	3,5
Coconut Ice (5)	150	0

Coconut Ice (6)	1100	0
Coconut Ice (7)	1100	0

Table 4. Continued

Coconut Ice (8)	1100	75
Coconut Ice (9)	1100	0
Coconut Ice (10)	1100	1100

Location : National housing of Antang (Code 1-4), Urip Sumoharjo Street (Code 5-6) and behind Al Markas Al-Islami Mosque (Code7-10)

Coconut Ice (1)	1100	0
Coconut Ice (2)	460	0
Coconut Ice (3)	>1100	3,5
Coconut Ice (4)	>1100	3,5
Coconut Ice (5)	>1100	0
Coconut Ice (6)	>1100	11
Coconut Ice (7)	>1100	0
Coconut Ice (8)	>1100	0
Coconut Ice (9)	>1100	0
Coconut Ice (10)	>1100	3,5

4. Discussion

Coliform is a group of bacteria used as an indicator of the pollution of impurities and conditions that are not good for water, food. The presence of coliform bacteria in food or beverages indicates the possibility of microbes that are enteropathogenic and or toxigenic which is harmful to human health [7,8,9].

The presence of contaminant bacteria in food and beverages can occur due to direct or indirect contamination with pollutant sources of bacteria such as soil, air, water, dust, human digestive tract or animals, especially bacteria that cause disease. Bacteria grown in food can turn food into organic substances that are reduced in energy. The metabolic results of certain species are favored by humans, but there are some metabolite-producing species in the form of exotoxins that are harmful to human health. The toxin produced by bacteria in the human digestive tract can cause symptoms such as abdominal pain, vomiting, and diarrhea [8,9].

This is because after observation result when sampling that at some place of sale does not fulfill the quality standard condition of land environment condition which can produce dust and traffic of crowded vehicles, and can also be caused by ice which is inserted into coconut water contaminated by coliform and fecal coli [8,9].

E. coli contamination usually occurs because these bacteria usually contaminate the tools used by the food

processing industry. The presence of bacterial contamination in food or processing equipment is an indication that sanitation practices in an industry are poor [10]. Improving sanitation, especially the environment, is one of the best solutions in anticipating microbial contamination. Poor sanitation that causes water contaminated with germs, causes waterborne disease. This can be a factor supporting the occurrence of foodborne disease in humans [10,11].

Sanitary is an essential part of urban health, improvement of sanitation not only affect health aspect but also social and economic development especially in developing countries. It is also important for elimination and eradication of neglected tropical disease (NTDs) [12-15].

5. Conclusion

The result of this research can be concluded that as follows:

1. All samples Coconut ice observed in this research has been contaminated by coliform. And 33.33% contaminated by fecal coli.
2. The amount of MPN coliform present in the sample is 150 to above 1100/100 ml sample, while the positive MPN fecal coli is 3.6 to 1100/100 ml of the sample (above the maximum contamination limit according to SNI).
3. Coconut ice sold in the city of Makassar is not feasible for consumption (does not meet health requirements).

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Competing Interest

The authors declare that we have no competing interests.

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