


## Bacteriological Quality Testing MPN Coliform Enterobacteriae On Soy Milk Sold At The Youtefa Market In 2023

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Article Info	ABSTRACT
<b>Keywords:</b> Coliform, Youtefa Market, Soy Milk.	Soybeans are a source of high quality vegetable protein for human consumption or made into products including soy milk. Poorly processed soy milk can be contaminated with disease-causing bacteria, one of which is the Coliform bacteria group. Coliform bacteria are a group of bacteria that are contained in large quantities in human and animal waste, so these bacteria are often used as indicators of food and water quality. Coliform bacteria can cause various diseases, one of which is diarrhea. The aim of this research is to determine the contamination of Coliform bacteria in unbranded soy milk sold at Youtefa Market. The type of research used is descriptive experimental research. Samples were analyzed using the Most Probable Number (MPN) method. The research results showed that 5 of the 5 samples tested were above the standard value, because the MPN value was >3/ml. The conclusion from the data analysis can be concluded that all samples tested contained Coliform bacteria contamination. Keywords: Coliform, Youtefa Market, Soy Milk.
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### INTRODUCTION

Coliform bacteria are microorganisms that can be used as indicators to determine the quality of contaminated water sources. Bacteria in food or drink indicates that the food has been contaminated by feces. The presence of coliform bacteria in food and drinks supports the possibility that there are enteropathogenic and toxicogenic microbes that are dangerous to health. Examples of coliform bacteria are *Salmonella* spp, *Enterobacter aerogenes*, *Klebsiella* spp, *Citrobacter* spp. Coliform bacteria are an indicator of milk quality. The lower the coliform content, the better the milk quality (Putri, 2018)

Pure soy milk is milk made from soybeans. This milk is widely consumed by people as a substitute for cow's milk for those who suffer from lactose intolerance. The contents of soy milk are very good for the body, including protein, iron, phosphorus, carbohydrates, fat, provitamins A and B. Poor processing of pure soy milk can cause the milk to be contaminated by microorganisms such as coliform (Novita Sunarti, 2015)

The beneficial microbes in soy milk are *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. These microbes help ferment milk by converting milk sugar (lactose) into lactic acid. Meanwhile, bacteria that can be dangerous include *E. coli*. Large infestations of *E. coli* and a weak immune system can damage health and cause diarrhea (Safrida et al, 2019)

Youtefa Market is one of the largest traditional markets in Jayapura City, with an area of around 12 Ha and has quite a large number of traders. The traders at Youtefa Market are not only from the Papuan tribe, but there are also those from other tribes (immigrants) such as the Javanese, Makassar, Butonese, Ambon and Toraja tribes. Even though there are traders who come from various immigrant tribes, the community of traders who come from the Papuan tribe has its own value of harmony with migrant traders, thereby adding to the sense of kinship between fellow traders and uniqueness compared to markets in other areas. Youtefa Market is located in the Abepura District of Jayapura City, this market provides various needs ranging from the need for clothing, food and shelter. This market is the main destination for buyers to buy various kinds of daily necessities, especially food products from traders' fields, such as vegetables, fruit, kitchen spices and 4 tubers as well as various types of fresh fish, which are abundant natural products from Papua. various regions. Another attraction of this market is that the goods sold, such as vegetables, are not sold based on weighing measurements but rather based on measurements that have been set by the traders, such as selling based on the number of measures/stacks.

To find out the safety of consuming soy milk, it is necessary to examine the soy milk. There are several microbial contamination found in dairy products, including *E. coli*, *Klasiella* sp, *Lactobacillus* sp, *Salmonella* sp, *Streptococcus* sp, and *Staphylococcus* sp. The most frequently seen bacterial contamination is coliform bacteria. Coliforms are a group of bacteria that are used as indicators of environmental, water, soil or food quality. Detection of these indicative organisms uses the standard Most Probable Number (MPN) method (Rizky et al., 2023)

The MPN (Most Probable Number) method is a microorganism enumeration method that uses data from the results of microbial growth in a specific liquid medium in a series of tubes grown from solid or liquid samples to produce a range of microorganism numbers in the closest estimate. The higher the level of coliform bacterial contamination, the higher the risk of the presence of other pathogenic bacteria that usually live in human and animal waste. Considering the importance of the quality or safety of consumed soy milk, it is necessary to conduct research to determine the microbiological quality of circulating soy milk (Harti, 2015)

According to SNI 2019 number 7388 concerning Maximum Limits for Microbial Contamination in Processed Food, Requirements and Supervision of Food Quality, namely the *E. coli* and total coliform content is < 3/100 ml of sample. Research conducted by Nugroho and Binugraheni in 2016 found that soy milk was contaminated by coliform bacteria which was sold by 5 sellers on the side of the road in Surakarta, with the results of 5 samples showing that 3 samples were positive. In Jayapura, soy milk can be easily found at sellers at the Youtefa Abepura Market. However, it is not yet known whether this soy milk is safe for consumption or not, therefore research was carried out on the bacteriological test of soy milk at Youtefa Market.

## METHOD

This type of research is descriptive using a laboratory observation design. Samples were taken at Youtefa Market and examinations were carried out at the Bacteriology Laboratory, D

III Medical Laboratory Technology Study Program, Health Polytechnic, Ministry of Health, Jayapura. The sample in this study was a total population of 5 Soy Milk samples at Youtefa Market

## RESULTS AND DISCUSSION

The results of research on coliform bacteria in soy milk drinks in the Youtefa Market Environment are as follows:

**Table 1** MPN Coliform examination results

Kode Sampel	Pengenceran LB			BGLBB			Hasil	(SNI, 2019) No.7388	Keterangan
	10	100	1000x	10	100	1000x			
1	5	5	5	5	5	5	>1600	< 3	TMS
2	5	5	5	5	5	5	>1600	< 3	TMS
3	5	5	5	5	5	5	>1600	< 3	TMS
4	5	5	5	5	5	5	>1600	< 3	TMS
5	5	5	5	5	5	5	>1600	< 3	TMS

TMS : Tidak Memenuhi Syarat

BGLBB : *Brilliant Green Lactose Bile Broth*

The results in table 4.1 show that the five samples of soy milk sold in the Youtefa Market area do not meet the requirements, where sample code 01 to sample code 05 has an MPN value of >1600/ml.

**Table 4.1** Coliform Confirmation Test results

Kode Sampel	Media EMB		Pewarnaan Gram		
	Ukuran Koloni	Warna Coloni	Bentuk	Warna	Sifat
1	Kecil	Methalic sheen	Coco bacil	Merah	Gram Negatif
2	Kecil	Methalic sheen	Coco bacil	Merah	Gram Negatif
3	Kecil	Methalic sheen	Coco bacil	Merah	Gram Negatif
4	Kecil	Methalic sheen	Coco bacil	Merah	Gram Negatif
5	Kecil	Methalic sheen	Coco bacil	Merah	Gram Negatif

The results in table 4.2 show that of the five samples of soy milk sold in the Youtefa Market area, sample code 01 to sample code 05 showed bacterial growth on the EMB media. Coliform Bacteria Quality Testing in soy milk drinks sold at Youtefa Market was carried out using the MPN (Most Probable Number) method with 3 stages, namely the estimation, confirmation and complementation stages. (Kurniawan, 2021). The results of research on soy milk drinks sold at Youtefa Market revealed that the five samples contained Coliform bacteria which had passed the predetermined microbial contamination threshold (Suriawira N. S, 2018)

Most Probable Number (MPN) is an examination of Coliform and *Escherichia coli* bacteria in food ingredients and fast food drinks. MPN examination has several methods, namely method 333, method 511 and method 555. MPN or APM examination with methods

511 and 555 is used for samples that have undergone processing and are estimated to have a smaller number of germs such as bottled drinking water and milk (Harti, 2015)

Coliform bacteria contamination in soy milk cannot be separated from the flow or processing of soy milk drinks starting from selecting ingredients, storing ingredients, processing and serving the soy milk drink itself. The Estimation Test was carried out to estimate the presence of coliform contamination in each sample on 5 soy milk samples. Based on the results of the estimation test on LB media, it was positive with turbidity and gas occurring in the Durham tube. The formation of gas indicates that the lactose fermentation process is occurring which produces CO<sub>2</sub>. Tubes that are positive in the diagnostic test for coliform bacteria are continued with a Confirmation Test (Suriawira N. S, 2018) The Confirmation Test is carried out after the predictor test to differentiate fecal and non-fecal coliform bacteria. The media used is BGLBB (Brilliant Lactose Bile Broth) which is a selective differential liquid media to confirm the presence of coliform bacteria in milk samples (Supomo et al, 2016).

The research results in table 4.1 show that 100% of the soy milk sold at Youtefa Market from 5 samples does not meet the requirements. Based on SNI 7388 2019 concerning Maximum Limits for Microbial Contamination in Processed Food, Requirements and Supervision of Food Quality, namely the E. coli and total coliform content is < 3/100 ml of sample. There are several factors that influence soy milk to be contaminated with Coliform bacteria, including traditional processing of soy milk, lack of sanitation and hygienic knowledge, which has the potential for contamination with pathogenic bacteria. Coliform Bacteria contamination can occur through raw materials, auxiliary materials, additional packaging materials, equipment and the environment. Contamination of soy milk can cause diarrhea (Soeparno, 2011).

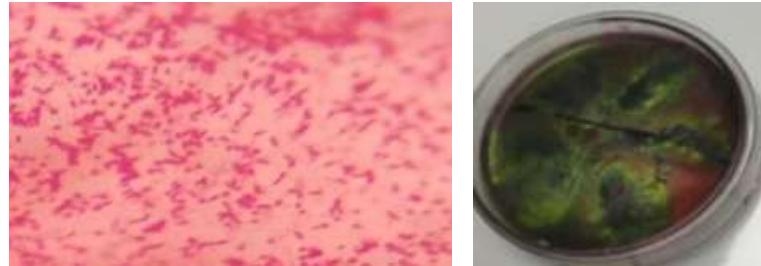
This research is in line with that carried out by Nugroho and Binugraheni in 2016, which found that soy milk was contaminated by coliform 42 bacteria sold by sellers on the streets of Surakarta, with the results of 5 samples showing that 3 samples were positive. Testing on EMB (Eosin Methylene Blue) media is a differential selective media used to identify bacteria. Bacteria that can ferment sucrose such as Enterobacter will appear pink, while E.coli will produce a metallic green color. Positive results (Large colonies, metallic green color, mucoid consistency, lactose and sucrose fermentation) (Sastrawijaya, 2013)

Morphological Test (Gram Staining) in the initial staining of bacterial cells is stained with an alkaline substance, namely Crystal Violet, followed by treatment using a mordant, namely iodine solution (Lugol). The cells were then washed with alcohol to remove crystal violet, after washing with water they were then stained with a counterstain, namely safranin. (Kurniawan F.B, 2018).

Cells that cannot release color and will remain colored like Crystal Violet, namely blue-purple under a microscope, are gram-positive bacteria, while cells that can release Crystal Violet and bind safranin so that they are pink under a microscope are called Gram-positive bacteria negative (Supomo et al, 2016).

Testing for Escherichia coli bacteria in soy milk uses a complementary test, namely using EMBA (Eosin Methylene Blue Agar) media to confirm the presence of Escherichia coli bacteria

and incubating for 24 hours at a temperature of 37°C. Colonies forming metallic green that grow on EMBA media indicate the presence of Escherichia coli bacteria. (Ruhi, S., Nurlila, R.U., Kartina, 2020)



**Picture 1** Results of examination of Gram Negative coliform bacteria and colonies on EMBA media

The presence of coliform bacteria in soy milk is an indicator to determine whether soy milk is contaminated by pathogens or not. It is possible that there are enteropathogenic and toxigenic microbial bacteria which are dangerous to health and can cause diarrhea, sepsis, meningitis and various other types of diseases (Sastrawijaya, 2013)

## CONCLUSION

The research results of 5 soy milk samples showed that they did not meet the requirements based on SNI number BPOM NO 13 TAHUN 2019 and it could be concluded that the 5 soy milk samples were contaminated with coliform bacteria.

## REFERENCES

- Harti, A. sri (2015) *Mikrobiologi Kesehatan Peran Mikrobiologi Dalam Bidang Kesehatan*.
- Kurniawan, F.B., Asrori, A. and Alfreda, Y.W.K. (2021) 'Identifikasi Bakteri Escherichia Coli Metode Mpn Pada Air Isi Ulang Diperumnas Iv Waena Abepura Tahun 2021', *Gema Kesehatan*, 13(1)
- Kurniawan F.B, I.T.S. (2018) *Bakteriologi Praktikum Teknologi Laboratorium Medik*. Edited by EGC. Jakarta: EGC.
- Novita Sunarti, R. (2015) 'Uji Kualitas Air Sumur Dengan Menggunakan Metode MPN (Most Probable Numbers)', *Bioilmi: Jurnal Pendidikan*, 1(1)
- Putri, A.M. and Kurnia, P. (2018) 'Identifikasi Keberadaan Bakteri Coliform Dan Total Mikroba Dalam Es Dung-Dung Di Sekitar Kampus Universitas Muhammadiyah Surakarta', *Media Gizi Indonesia*, 13(1)
- Rizky, V.A. *et al.* (2023) 'Identifikasi Bakteri Coliform pada Susu Kedelai Menggunakan Metode MPN (Most Probable Number)', *Jurnal Ilmiah Kesehatan Rustida*, 10(1)
- Ruhi, S., Nurlila, R.U., Kartina, I. (2020) 'Pengaruh Lama Penyimpanan Susu Kedelai Pada Suhu Kulkas 2-8°C Terhadap Bakteri Coliform Metode MPN (Most Probable Number)', *Jurnal MediLab Mandala Waluya Kendari*
- Safrida, Y.D., Raihanaton and Ananda (2019) 'Uji Cemarkan Mikroba Dalam Susu Kedelai', *Serambi Engineering*, IV(1).
- Sastrawijaya (2013) 'Analisis Kualitas Air dan pencemaran air pondok Lapan kecamatan

Salapian Kabupaten Langkat’.

SNI (2019) *Batas maksimum cemaran mikroba dalam pangan Badan standardisasi nasional Indonesia*.

Supomo, S., Kusumawati, E. and Amin, M. (2016) ‘Uji Cemaran Coliform pada Ice Coffee Blended yang Beredar di Kecamatan Samarinda Ulu dengan Menggunakan Metode MPN (Most Probable Number)’, *Jurnal Kebidanan*, 2(2), pp. 92–96. Available at: <http://ejournalmalahayati.ac.id/index.php/kebidanan/article/view/574>.

Suriawira N. S (2018) *Mikrobiologi Air*.