

A Case Study: Detection of Coliform in Ready to Drink Soybean Milk sold on stalls in Bangkok, Chiangmai, Nakhonsawan and Nakhon Ratchasima Provinces in Thailand.

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Abstract

Nowadays, Tofu is one of the most famous beverages among Thai people in the morning because it's easy to buy at the nearby stalls on the sidewalk. Consumers think that it is a healthy drink to replace breakfast during rush hours. Therefore, Soybean milk is another option for consumers in this era. From the popularity, there is some doubt about cleanliness in the product. The group has the objective of proving it, namely the detection of soybean milk by using a Coliform bacteria test to identify bacteria in soybean milk. The test result has shown that Soybean milk contaminated with Coliform detected did not pass the criteria of 5 samples, representing 14.29 % of all 35 samples. In conclusion, from the random of the ready to drink soybean milk in Bangkok, Chiang Mai, Nakhonsawan and Nakhon Ratchasima Provinces cause by many factors, for instance; dirty container, various tools involved in production and preparation of soybean milk including side dishes such as red beans, millet that may be contaminated with bacteria as well.

Keywords: Bacteria Coliform, Ready to Drink Soybean Milk, Soy Milk

Introduction

Soybean, *Glycine max* (L.) Merrill) is considered to be one of the important economic crops of Thailand because it is the main ingredient in the several domestic industries for consumers and food for animals

Soybeans are plants that provide high nutritional benefits and also contain substances that are good for physical health and also help to prevent some diseases. In soybeans, there are 30-50 % of protein, 13 -25 % of fat and 14-24 % of Carbohydrate, especially soybeans contain with high levels of protein with low saturated fat. Moreover, there is no cholesterol and being a source of Linoleic Acid and Linolenic Acid which the body cannot able to synthesize. Hence, it is necessary to be obtained from soybean protein food. Soybeans give a similar nutrition to animal proteins. Therefore; Soybeans are suitable protein for people who do not consume meat. Eating soy proteins helps reduce cholesterol levels that is the risk of cardiovascular disease. In addition, soybeans contain Isoflavones Phytoestrogens chemicals which is a substance helping to prevent blood clotting and cancer in humans. There are many types of soybean products such as bean paste, tofu, soy sauce, soybean milk, soybean oil, etc¹. Currently, Thai people like to drink soybean milk every day in the morning because it can buy at the stalls on the and consumers think that it is a healthy drink to replace breakfast. Soybean milk is the favourite of Thai people to drink since the ancestors age till now. It is also consistent with the era which the people take care of their health. Thus, Soybean milk is another option for consumers in this era². Tofu or soybean milk is a drink made from soybeans by grinding soybeans with water and squeezed away. There may add salt or sugar in Soybean milk. There are natural fibres that are good for the digestive system and it is contained the important component (Isoflavones). After consuming Soybean milk, the body will turn this chemical into a fi -spongegen. (Phytoestrogens) with structures similar to Estrogen, a female hormone that affects the function of the reproductive system and various conditions related to this type of hormones. For these reasons, scientists expect various components in Soybean milk, as well as Isoflavones, can benefit health and may result in condition for treatment³.

Coliform is a group of Gram-Negative Bacteria, no spore forming is a developed bacterium, both air and without air (Facultative Anaerobe). We can ferment Lactose sugar to create acid and gas at 35-37 degrees Celsius within 48 hours. It can be easily destroyed by heat, pasteurized levels (Pasteurization) don't produce oxidase negative.

The word Coliform comes from colon because this bacterium is often found in the intestine of warm-blooded animals but many Coliforms have found in the soil. Most Coliform bacteria are not pathogenic microbes (non-Pathogen), but the amount of Coliform Bacteria Count is used as a food sanitation and a lot of corasty bacteria in food and water indicated uncleanness and unhygienic. There may be contamination of people's faces or warm-blooded animals⁴. The most well-known Coliform is *Escherichia Coli*, *E. Coli*. It is an infection that lives in the intestine of warm-blooded animals but can be found in the natural environment and spread to the food production place, as well as *E. Coli* (*E. Coli*), most of them are not dangerous. But some species can cause food poisoning

and severe diseases ⁵. Soybean milk is another food that has nutritional value, popular and available in general, easy to find in the stalls on the sidewalk or market. It is a simple production but often cannot be inspected by various departments causing this tofu to be contaminated especially in food that are sold by hawker stalls. There are a lot of hawker stalls, especially in the big cities ⁶, such as Bangkok, Chiang Mai, Nakhon Ratchasima, Nakhonsawan. From the Safe Food report of the Department of Medical Sciences in 2019-2020, soybean milk is not included in the list. In this study, the researchers are interested in studying bacteria contaminated in soybean milk that is sold at the stalls on the sidewalk to be the information for consumers to determine to buy safe food by conducting a sample study from Bangkok, Nakhon Ratchasima, Chiang Mai and Nakhonsawan because it is a large province in a large number of people living.

Research Objective

To find contamination of Coliform in Soybean milk

Research Method

Method

This study is a cross sectional study. The researcher aims to study contamination of Coliform in Soybean milk sold in the stalls on the sidewalk in Bangkok, Nakhonsawan and Nakhon Ratchasima.

Population samples

Sampling in this study is the convenience sampling method by buying a sample from 35 soymilk carts, 15 samples from Bangkok and 5 samples from the district in Chiang Mai, 10 samples, bought in the district in Nakhon Ratchasima and 5 samples from Nakhonsawan.

Tools and Equipment

For this detection, the researcher used the detection kit from the Department of Medical Sciences. The technique of the test is Microbial detection by using prefabricated food sheets to culture by sucking 1 cc sample water and spraying water in a zip lock bag and closing the envelope completely. All the air is removed and kept in the dark and at room temperature to let the germs grow for 24 hours and read the results as specified by the test set finally.

Equipment

1. 35 pieces of the test paper
2. 35 sterile injection tubes
3. 35 sterile plastic bags
4. 1 and 2 bottles of liquid
5. 1 set of cotton wool and alcohol bottle
6. 1 bottle of disinfectant
7. 1 test manual
8. Scales (that can read at 1 gram)
9. Scissor
10. Long handle spoon
11. Lighter or Alcohol Lamp

Procedures

1. Use a cotton ball moistened with alcohol to wipe the hands on both sides, spoon, scissors and food containers and the area where the container must be opened.
2. Use the lighter to burn the scissor and hold it for a moment before cutting the container. (Can use alcohol lamps instead of lighter)
3. Use the lighter to burn the spoon and hold it for a moment. (Can use alcohol lamp instead of lighter)
4. Use a spoon in Article 3. scoop the food sample, weighing 11 grams, put in a plastic bag without sterile.
5. Pour 1 bottle of liquid into a plastic bag and shake at least 25 times.
6. Use a water tube to suck water from the bag for 1 CC. (beware of the contamination from the outside. Do not let the lower part of the injection tube be exposed to the inspector or other things before using the water). Inject all in a bottles Item 2 and close the lid tightly and shake the bottle at least 25 times.
7. Use a new injection tube to suck water from the bottle in item 7 for 1 cc.
8. Touch the tube at the injection tube with the test paper to spray the water out entirely.

9. Compress the air out of the envelope, gently tested, closed the envelope completely, storing the test paper in the dark at room temperature for 24 hours.

Data Collection

This study is collected properly from March - June 2022.

Data Analysis

Use descriptive statistics, which are frequencies, percentage, average and standard deviation by analyzing the test results from the number of red spots that occur on the test paper. Then judge the table to read the results in the diagram 1.

Types of Food	Number of the Red Spots	Measurement	Number of Coliform (Per 1 gram)
Food according to the Act of the Ministry of Health			
1.1 Jam, Jelly, Sweeten-Condensed Milk, Seasoning Sauce, Food in the containers that tightly closed, Soybean Milk	0 1 or > 1 0 - 10	Pass Don't Pass Pass	The Number of the red spots multiplied by 100
1.2 Pasteurized Milk at the source of production	> 10	Don't Pass	

Result

From the detection of Coliform contamination in soybean milk (Tofu), it was found that from a total of 35 samples, Coliform was detected in 5 samples, separated into 4 samples from Bangkok, representing 26.67% and samples from Chiang Mai 1 sample, representing 20%. There is no detected Coliform in any samples from Nakhon Ratchasima (N = 10) and Nakhonsawan (N = 5). (Table 1)

Table 1 Result of Coliform Detection in Soybean Milk (n=15)

Source of samples	Number of samples	Number of samples with the red spots	Percentage of the red spots
Bangkok	15	4	26.67%
Chiangmai	5	1	20%
Nakhon Ratchasima	10	0	0
Nakhonsawan	5	0	0
Total	35	5	14.29%

From the study, the Coliform detection was found on 4 samples from Bangkok. The number of red spots shown on the test paper is between 21-500 counts, which was calculated in the number of coliforms per 1 gram of food. There is contaminated Coliform between 2,100-50,000 counts in the samples from Chiang Mai. 1 Coliform was found that there are 15 red spots showing on the test paper, which was calculated as the number of Coliform per 1 gram of food. There was 1,500 counts. (Table 2)

Table 2 Quantity of Coliform Detection in soybean milk (n=35)

Source of samples	Number of samples	Number of samples with the red spots	Number of Coliform (Per 1 gram) (Number of the red spot x 100)"
Bangkok 1	1	500	50,000
Bangkok 2	1	21	2,100
Bangkok 3	1	106	10,600
Bangkok 4	1	36	3,600
Chiangmai 1	1	15	1,500
Total	5	-	-

Discussion

According to the study of Coliform in the samples of the remaining bean milk from a total of 35 stalls, 15 samples from Bangkok, 5 samples from Chiangmai, 10 samples from Nakhon Ratchasima and 5 samples from Nakhonsawan. There are shown "Don't pass" for 5 samples, representing 14.29% of all samples. When analysing soybean milk samples from each area, it was found that 4 samples from the Bangkok Zone from a total of 15 (26.67%), samples or coliform quantity between 2,100- 50,000 counts per gram, samples from Chiang Mai detected 1 out of 5 samples, representing 20% of all samples from Chiang Mai, detected 15 red spots or the amount of 1,500 per gram. There is no detected coliform in soybean milk at all from Nakhon Ratchasima and Nakhonsawan. This study has shown that Soybean milk samples are contaminated. This may be because sample of soybean milk which sold in stalls on the sidewalk may cause more contaminated than it should in the package due to the traffic of the car along the road such as cones and tools involved in production and preparation of soybean milk including side dishes such as red beans, millet may be contaminated bacteria because these components after cooked, will be packed in a jar which is opened all the time and it was not cooked again before mixing in soybean milk that may result in contaminated bacteria in soybean milk. Furthermore, If no eating immediately after purchasing, the bacteria was increased by time as a result of detecting coliform in the mentioned table.

Conclusion

From the detection of coliform contaminated in the remaining soybean milk sold at stalls in Chiang Mai, Nakhonsawan and Nakhon Ratchasima are found in the number of Coliform from the sample products because of many factors; the dust, dirty container in various tools involved in production and preparation of soybean milk including side dishes such as red beans, millet may be contaminated with bacteria. Thus, there is Coliform detection found in ready to drink soybean milk.

Recommendation

Choosing soybean milk that is sold in the stalls on the sidewalk. It's not only hygiene of the products and the stalls but also hygiene of the soybean milk and side dishes that are put in the same bag.

Limitation

This study was collected from some areas in Bangkok. Chiang Mai, Nakhon Ratchasima and Nakhonsawan. Only the result of this study may not be able to summarise the overall with coliform contamination entirely in soybean milk. This study was conducted in March 2022.

References

1. Changboonmee, P. (2013). Influence of germination and drying processes with fluidized sesen techniques on the quality of soybeans starting to germinate [thesis]. Bangkok: Silpakorn University
2. Chokdeepenleard, A. (2018). Tofu business for the younger generation in kiosk [independent research]. Bangkok: Thammasat University.
3. POBPAD. (2021). Tofu [Internet]. Bangkok: Pobpaddotcom(PobPad.com); [Accessed 1 June 2022]. <https://www.pobpad.com/%E0>
4. Food Network Solution. Coliform [Internet]. Bangkok: Food Network Solution 2016 Food Information Network Centre [Accessed 1 June 2022]. <https://www.Foodnetworksolution.com/wiki/word/1127/Coliform-%E0%B9%82>
5. 3M Science Applied to Life. (2021). Food Safety [Internet]. Bangkok: [Accessed 1 June 2022]. https://www.3m.co.th/3M/th_TH/food-safety-th/education/pathogenic-microorganisms/Coliform/
6. Rocket Media Lab. (2022) Survey of the number of food sources by district of Bangkok [Internet]. Bangkok: [Accessed 5 June 2022]. <https://prachatai.com/journal/2022/04/98377>
7. Department of Medical Sciences. Summary report on the performance of the Food Safety Integration Project for fiscal year 2020 [Internet]. Nonthaburi: Ministry of Health; 2020 [Accessed 5 June 2022]. <http://bqsf.dmsc.moph.go.th/bqsfWeb/wp-content/uploads/2021/09/Food-safety-report-63.pdf>
8. The Department of Health advises how to choose hawker food - stalls in tiny dusty areas [Internet]. Bangkok: Bangkok Business 2019 [Accessed 5 June 2022]. <https://www.bangkokbiznews.com/social/824648>
9. The database promotes and elevates the quality of OTOP products. Bangkok: Library and Information Science and Technology Center, 2010 [Accessed 5 June 2022]. <http://www.sptn.dss.go.th/otopinfor/index.php/en/knowledge/informationrepack/384-bacteria-in-food?showall=1&limitstart>