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Analysis of Total Plate Count (TPC) in Pukis Cakes Sold in Traditional Markets

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Abstract: *Pukis cake is a traditional Indonesian cake. Pukis cakes are much liked by the public because pukis cakes have a savory and sweet taste so they become one of the attractions of the cake. Pukis cake has a lot of nutritional content. One of the parameters used in determining the feasibility and safety of food is to measure the microbiological content in food. Biological hazards, especially microbes in food, need attention because this type of hazard is often the causative agent of food poisoning cases. This research was conducted to know the Total Plate Count (TPC) in Pukis Cake. The study began with the isolation of microorganisms from Pukis Cake samples, followed by the calculation of the Total Plate Count (TPC). The results showed that the Total Plate Count (TPC) of the sample 1 was $1.19x10^4$ colonies/g ($>1x10^4$), the sample 2 was $19.44x10^4$ colonies/g ($>1x10^4$), samples 3 were $11.35x10^4$ colonies/g ($>1x10^4$), samples 4 were $19.93x10^4$ colonies/g ($>1x10^4$). These results show that the pukis Total Plate Count (TPC) exceeds the standard set by SNI Number 7388 of 2009, namely TPC with a maximum limit of $1×10^4$ colonies/g.*

INTRODUCTION

The danger of disease can occur associated with food. This hazard can occur because of the processes that occur in food, the nature that is present from the origin, or because harmful substances from outside enter or stick to contaminating the food. Food can be said to be safe if it is unlikely or not at all likely to be a source of disease (Kemenkes RI, 2018). Diseases that originate from food are known as foodborne diseases. This situation is the reason food must be prepared, processed, stored, transported, and served in clean conditions and cooked properly (Lukman, 2020).

Street food is often found in almost every place. Snacks are popular in the community and have various types. Snacks are prepared and sold by street vendors, in wheelbarrows, or public places. These foods can be consumed by being eaten directly, and or consumed without further preparation (Hanifah *et al*., 2020). Aside from being a source of nutrition, food can also act as an intermediary for disease. The role of food as a carrier of disease germs should be prevented or minimized (Kemenkes RI, 2018).

The Decree of the Minister of Health regarding food safety, quality, and nutrition, it is explained that a good method of food production must pay attention to aspects of food safety by

preventing contamination of food by biological contaminants which are disturbing, harmful, and harmful to health (Kemenkes RI, 2018). However, in reality, only a few food vendors comply with these rules and are usually only implemented by food vendors who are well-managed (Fitria & Asniar, 2018)). One of the parameters used in determining the feasibility and safety of food is to measure the microbiological content in food (Hezam *et al*., 2019). Problems in the food sector include bacterial contamination of the food served, both from street vendors, restaurants, catering services, and the food industry (Permatasari *et al*., 2021).

Snack food is still at risk to health because its handling is often unhygienic, which allows snack food to be contaminated with harmful microbes. After all, the manufacturing process is not clean, and the cleanliness of the place where snacks are stored and sold is neglected. The maximum limit for microbial contamination is the maximum permitted concentration of contaminants in food (BPOM, 2012). Quality-assured food safety is free from biological, chemical, and physical hazards (BPOM, 2012). Biological hazards are generated by living things such as microbes that can produce toxins, which can cause disease (Badan Ketahanan Pangan, 2020).

Food sales on the roadside are often found in areas around offices, educational areas, or in markets. People choose to buy food from roadside sales for the reason that it is cheap and easy to get. However, poor environmental conditions can contaminate the food *(*Yustiani *et al*., 2019). Sales locations that are in open spaces such as on the side of the road are prone to contamination by groups of bacteria such as *Escherichia coli*, *Enterobacter*, *Shigella*, *Salmonella*, and *Klebsiella* (Darna *et al*., 2017). The risk of microbial contamination of food products sold in open areas is quite high. This is in accordance with previous research, the TPC value of the klepon cake in several samples did not meet the requirements (Lestari & Rahmawati, 2019). The gravy pentol that is sold on the side of the road, the TPC value shows that 7 out of 10 samples exceed the maximum threshold (Sa'adah *et al*., 2021). Bacteria *Escherichia coli*, *Providencia* sp, *Enterobacter* sp, and *Serratia* sp. ever found in fried foods sold around the street (Hajar, 2020).

One of the snacks that people like is pukis cake because it tastes savory and sweet (Holidya, 2019). Pukis cake is a traditional Indonesian cake. Pukis cakes have a distinctive shape and color (Silfana & Fauzzia, 2020); (Saludung & Ratnawati, 2021). Currently, there are many pukis cakes available either in cake shops or made by street vendors. There is no information regarding the microbiological quality of pukis cake. As it is known that the TPC parameter in food products is very important to note because it relates to the safety of food products for consumption. For this reason, research on the Analysis of Total Plate Count (TPC) was carried out on Pukis Cakes Sold in Traditional Markets. With this research, it is hoped that it will become a source of reference for the community reference. The purpose of this study was to determine the Total Plate Number (TPC) of Pukis Cakes sold in Traditional Markets.

METHOD

Research Materials and Tools. The materials used included Pukis Cake samples, PCA (*Plate Count Agar*) media, spirits, 70% alcohol, distilled water, and tissue. The equipment used includes spirit lamps, incubators, autoclaves, laminar air flow, ovens, hot plates, stir bars, spray bottles, beakers, Erlenmeyer flasks, analytical balances, Petri dishes, sterile cotton, coffee paper, gauze, test tubes, pipette micropipette, and tip.

Sterilization. Tools in the form of Petri dishes, beaker glasses, Erlenmeyer, and test tubes are washed clean first and then dried. Then sterilized using an autoclave at 121 ^{0}C for 15 minutes.

Making of microbial growth media. The media used in this study was PCA (Plate Count Agar) media. PCA media, according to a predetermined formula, was put into 1000 mL of distilled

water. The solution was homogenized and boiled using a hot plate and a magnetic stirrer. Covered with aluminum foil. Sterilize by autoclaving at 121°C for 15 minutes.

Total Plate Count (TPC) Test. 1). Pukis packaging was opened aseptically, then weighed 10 grams of each sample that had been mashed, then put the refined sample into the Erlenmeyer, added 90 ml of sterile distilled water was. After all the samples were put into the Erlenmeyer, homogenized with cotton covered. From this preparation, a 10^{-1} dilution was obtained. 2). Stratified dilutions were made from the pukis sample. Take 1 ml of the suspension from the 10^{-1} dilution, put it into a tube containing 9 ml of sterile distilled water, then homogenize it to get a 10^{-2} dilution. Take 1 ml of the suspension from the 10^{-2} dilution, put it into a tube containing 9 ml of sterile distilled water, then homogenize it to get a 10^{-3} dilution. Take 1 ml of the suspension from the 10^{-3} dilution, put it into a tube containing 9 ml of sterile distilled water, then homogenize it to get a 10^{-4} dilution. 3). Take 1 ml of suspension from each retail and put it into a sterile petri dish aseptically. 4). In each petri dish, PCA medium was added which had been diluted, then homogenized so that the suspension was spread evenly and allowed to solidify. 5). Each petri dish was wrapped in paper and then incubated at 37^0C for 18-24 hours. 6). Calculation of growing bacterial colonies was carried out to determine the total plate number.

RESULT AND DISCUSSION

The results of the Total Plate Count (TPC) research on Pukis Cakes Sold in Traditional Markets are shown in Table 1.

Table 1. Total Plate Count (TPC) in Pukis Cakes Sold in Traditional Markets

Sample	TPC Sample (colonies /g)	Limits of Microbial Contamination	Conclusion
1	$1.19x10^4$	$1x10^4$	$> 1x10^4$
2	$19.44x10^4$	$1x10^4$	$> 1x10^4$
3	$11.35x10^4$	$1x10^4$	$> 1x10^4$
4	$19.93x10^4$	$1x10^4$	$> 1x10^4$

Note: The results of calculating TPC on Pukis Cakes Sold in Traditional Markets are the average result of 2 repetitions (duplo). Sample 1 (Pukis Cake from Trader 1); Sample 2 (Pukis Cake from Trader 2); Sample 3 (Pukis Cake from Trader 3); Sample 4 (Pukis Cake from Trader 4).

Analysis of the total plate number (TPC) on pukis cakes was carried out with the aim of knowing the microbial contamination of pukis sold in traditional markets. TPC is intended to show the number of microbes present in a product by counting the bacterial colonies grown on agar media. The sample used in this study is pukis cake which has no production date and expiration date. Samples were taken from pukis cake traders who were obtained from traders from one of the traditional markets. There are 4 traders who sell Pukis cakes, 1 sample is taken from a trader who sells Pukis cakes at a cake shop and 3 samples are taken from 3 different traders who provide Pukis cakes by making them directly and selling them on the roadside.

TPC examination on pukis is said to meet the requirements if it complies with the provisions of SNI Number 7388 of 2009, namely the maximum limit of 1×10^4 or around 10000 colonies per gram sample (SNI, 2009). Based on the results of calculating the amount of bacterial contamination through the TPC test on pukis cakes at traditional markets, it is known that 4 samples of pukis cakes are contaminated with microbes. Pukis cakes from trader 1 were $1.19x10^4$, pukis cakes from trader 2 were $19.44x10^4$, pukis cakes from trader 3 were $11.35x10^4$, pukis cakes from trader 4 were $19.93x10^4$. Of the 4 contaminated samples, all samples did not meet the quality requirements for wet cakes because the number of total plate numbers exceeded the SNI standard. Pukis cake from

trader 1 where a trader sells pukis cake in a cake shop, found the lowest amount of TPC. Meanwhile, the other 3 samples had more bacteria than the bacteria found in pukis cakes sold in cake shops.

Based on the observation results, trader 1 sells pukis in the shop, the pukis are stored in a closed room and away from sources of pollution, but the shop is busy with buyers, which allows microbial contamination to arise. Whereas for traders 2, 3, and 4, traders process and pack pukis cakes in open spaces on the side of the road which are a source of pollution, and use equipment that is not kept clean enough. The large number of microbes found in this study can be caused by storage containers, food handlers, and vending equipment *(*Sa'adah *et al*., 2021). Food handlers use equipment that is unclean and repetitive and stored in open spaces (Irawan, 2016). Dirt left on unclean equipment and dust from air pollution due to equipment storage in open spaces can be a cause of microbial contamination of food (Permatasari *et al*., 2021).

In addition, contamination in pukis cakes can be caused by various factors including the spread of bacteria through human hands due to the processing process that pays little attention to the level of cleanliness. Unclean sellers' hands and unhygienic tools can cause bacterial contamination of food. Hands are the main entry point for pathogens from outside the body that can cause disease (Ardhayanti *et al*., 2018). The condition of the market environment which is crowded with shopping visitors can also cause the spread of bacteria, due to the condition of the open pukis cakes without being wrapped so they are very easily contaminated with bacteria (Jamilatun, 2022). Air sanitation and storage temperature are also factors that cause microbiological contamination in food (Hajar, 2020). Polluted environment, including dirty air, contributes to the contamination process (Putri & Kurnia, 2018).

Storage at room temperature increases the number of microbes, especially in foods that are served in an open place, the increase in total microbes can reach two times the original number, and can be contaminated with pathogenic bacteria such as *Escherichia coli*, *Staphylococcus aureus*, *Bacillus cereus*, *Salmonella*, and other pathogenic bacteria (Hajar, 2020). Microorganisms in the samples can also come from the process since they are transferred from the cooking equipment to being given to the buyer (Yustiani *et al*., 2019). Food samples can be said to be unfit for consumption if viewed from the point of view of the presence or absence of microorganisms. Microbial contamination needs special attention because the presence of microbes in the food cannot be seen by the naked eye, and does not damage the appearance, taste, and smell, so it will be difficult to detect whether the food is contaminated or not. Microbial contamination is important in food safety because if there is food contaminated by microorganisms it will cause the food to spoil, reduce shelf life and endanger human health (Sa'adah *et al*., 2021).

Based on these results, it is suggested that the hygiene of roadside food vendors be improved both in terms of the tools used and the sales environment. To minimize the presence of microorganism contamination, it is advisable to maintain the sterility of materials or tools used. So that the sale and purchase of pukis cakes can guarantee the quality for consumption and will not have any impact on health in the near future or in the long term (Harti, 2015). Good handling can be applied to food so that it is not contaminated with pollutants in the environment. In addition, it is also recommended that consumers do additional processing before consuming these foods (Yustiani *et al*., 2019).

CONCLUSION

Total Plate Number (TPC) of the pukis sample was obtained, sample 1 was $1.19x10^4$ colonies/g (>$1x10^4$), sample 2 was $19.44x10^4$ colonies/g (>$1x10^4$), sample 3 was $11.35x10^4$ colonies/g (>$1x10^4$), sample 4 was $19.93x10^4$ colonies/g (>$1x10^4$). These results show that the Total Plate Number (TPC) of pukis cakes exceeds the standard of SNI Number 7388 of 2009 which has been established, namely TPC with a maximum limit of $1×10^4$ colonies/g

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