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Total Plate Count (TPC) Value of Chicken Pentol Snacks Sold in the Kelapa Dua Raya Area, Depok

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ABSTRACT

Pentol is a street food product made from a mixture of tapioca flour and chicken meat. The public widely favors it due to its palatable taste and relatively affordable price. In Depok City, Kelapa Dua Raya is one of the areas where pentol is commonly sold. However, pentol is at high risk of microbial contamination due to inadequate hygiene during the preparation process and its typical sale in roadside settings. This study aimed to determine the Total Plate Count (TPC) values of Pentol sold in the Kelapa Dua Raya area, Depok. The samples used in this study were pentol obtained from 5 different vendors with duplicate analysis and 8 serial dilutions. Samples were analyzed using the spread plate method on Plate Count Agar (PCA) medium with Buffer Peptone Water (BPW) as the diluent. Colony counts were performed in accordance with the Standar Nasional Indonesia (SNI) 2897:2008, with a countable range of 25–250 colonies per plate. The results showed that the average TPC values were 1.1×10^7 colonies/g for sample 1, 7.3×10^6 colonies/g for sample 2, 1.5×10^5 colonies/g for sample 3, 6.8×10^7 colonies/g for sample 4, and 7.9×10^6 colonies/g for sample 5. Four samples, namely samples 1, 2, 4, and 5, exceeded the maximum threshold set by the Food and Drug Supervisory Agency (BPOM) Regulation No. 13 of 2019 at 1×10^6 colonies/g, while only one sample met the standard.

INTRODUCTION

Kelapa Dua Raya is a culinary area located in Tugu Village, Cimanggis District, Depok City. Kelapa Dua Raya is strategically located, surrounded by various educational institutions and residential areas, making it a promising culinary center for traders. Different types of food vendors can be found in this region, including street vendors. Street vendors are traders who sell their food in public places using carts or stands (Khairullah et al., 2022). Several types of street food are sold in Kelapa Dua Raya, including pentol. Pentol is a small

meatball made from a mixture of starch flour and chicken meat. Pentol is one of the street foods that is widely sold in the Kelapa Dua area (Haderiah & Sari, 2020).

Street vendors selling food on the side of the road may increase the risk of bacterial contamination of the food they sell (Jamilatun, 2022). Sanitation and cleanliness of food processing, which is not paid attention to by traders, can also be a factor causing pathogenic bacterial contamination (Ubaidillah & Ristiani, 2022). Various studies have reported that street food is often contaminated with pathogenic bacteria, including *Escherichia coli*, *Salmonella* spp., and *Staphylococcus aureus* (Mawaddah LR, 2022; Nofrianti et al., 2022; Septiyasari & Sofyanita, 2023). Consuming food contaminated with pathogenic bacteria can cause foodborne illnesses, such as food poisoning (Mayaserli & Anggraini, 2019). Symptoms of food poisoning include diarrhea, nausea, vomiting, and difficulty swallowing (Rorong & Wilar, 2020).

Cases of food poisoning remain a public health problem in various countries. According to the report by the World Health Organization (WHO) in 2020, there were around ± two million deaths each year due to food poisoning. The highest percentage of deaths occurred in Africa and Southeast Asia. Data from the Food and Drug Supervisory Agency (BPOM) in 2021 recorded that in Indonesia, there were 50 cases of food poisoning cumulatively, with a total of 256,900 people exposed, 178,300 people sick, and around 1,000 people died. The provinces with the highest cases include West Java with 25 cases, Central Java with 17 cases, East Java with 14 cases, Bali with 13 cases, and West Nusa Tenggara with 12 cases. In addition, in East Kalimantan, specifically in Tenggarong City, there were 35 reported cases of food poisoning among schoolchildren in 2021 due to consuming outdoor snacks and fast food (Patniawati et al., 2023). It shows that food safety, especially in street food, still requires serious attention because it directly impacts public health.

Inspection Total Plate Count (TPC) or Total Plate Number (ALT). It is necessary to find out the level of bacterial contamination in street food. TPC is one of the parameters used in food safety checks to calculate the total number of bacterial colonies in food. BPOM Regulation Number 13 of 2019 concerning the Maximum Limit of Microbial Contamination in Processed Foods states that the maximum limit of TPC in processed foods is 1×10^6 colonies/g (BPOM, 2019; SNI, 2008). A value TPC that exceeds the threshold indicates that the food does not meet the food safety standards set by BPOM. Inspection TPC is an important indicator for determining the microbiological quality of a food product,

especially for street food, which is often consumed by the public.

Several studies in Indonesia show that street food, especially pentol, still exhibits high levels of microbiological contamination, as indicated by TPC parameters. Research in Central Tarakan and West Tarakan Districts in 2025 reported that all pentol samples tested had TPC values exceeding the maximum limit set by BPOM (1×106 colonies) (Nurfadilah et al., 2025). Similar findings were also reported in Surabaya, where nine of the twelve street food samples had TPC values above the permissible threshold (Ainutajriani et al., 2023), and in Sungai Kunjang District, Samarinda City, which showed that seven pentol samples from different traders had a TPC value that exceeded the maximum limit, which was 1×106 colonies/g (Aryanti E et al., 2023).

Based on previous research, many street food vendors still do not meet food safety standards as measured by TPC parameters. Research on the value of TPC in street food, especially pentol sold in the Kelapa Dua Raya area, Depok, has not been conducted to date. This research gap underscores the novelty and urgency of conducting similar research. Therefore, this study aims to analyze the TPC value in five samples of pentol snacks sold in the Kelapa Dua Raya area, Depok, and assess their conformity with the food safety standards set by BPOM. The TPC value obtained from the pentol snack can provide an overview of the product's microbiological safety. In addition, this study is expected to serve as a reference for future research, particularly in the application of the TPC method to food microbiological testing.

RESEARCH METHODS

Study Design

This study is a quantitative descriptive research that aims to determine the value of TPC pentol sold in the RW 11 Kelapa Dua Raya area, Depok. This study was conducted to provide an overview of the level of microbial contamination in street food with TPC parameters.

Sample and Population

The population of this study is all the products sold in the RW 11 Kelapa Dua Raya area, Depok. The sample consisted of 5 participants from 5 traders, selected through purposive sampling. The sampling criteria include pentol sold by roadside traders, pentol sold cooked, and pentol not dipped in sauce or soy sauce. Each sample was analyzed with two repetitions (duplo) to obtain more reliable results.

Tools and Materials

The tools used in this study were measuring cups, label paper, disposable petri dishes, test tubes, tube racks, Erlenmeyer, beaker glass, autoclaves, incubators, bunsen, matches, spreaders, vortex, blue tip, hot

plates, spinbars, biosafety cabinets, colony counters, mortar and pestles, cotton, thinwall, micropipettes, drip pipettes, analytical balances, spatulas, weighing paper, heat-resistant plastic, plastic wrap, tissue and markers. The materials used are Plate Count Agar (PCA) as a medium for bacterial growth, Buffer Pepton Water (BPW) as a diluent, aquadest, and 70% alcohol solution.

Procedure

The TPC testing method in this study is based on the Indonesian National Standard (SNI) 2897:2008 on microbiological testing methods for food products. The stages of the research include pre-analytical, analytical, and post-analytical. This study uses the Spread Plate or scatter cup method, which is spread using a Spreader. The Indonesian National Standard suggests using the term " for flat. However, Soesetyaningsih conducted his research using the Spread Plate, and the results for flat show little difference in colony growth. Both methods can be used to test the TPC value by calculating the number of colonies grown on PCA medium from the 10-1 to 10-8 dilution series (Soesetyaningsih, 2020).

Data Collection and Analyze

Pre-Analytics

The pre-analytical stage begins with preparing the tools and materials. All tools are then sterilized in an autoclave for 15 minutes at 121°C and 1 atm. Pen sampling was carried out in the Kelapa Dua Raya area, and then stored in a sterile container and tested. The pentol sample was then mashed and weighed up to 25 grams.

Analytics

The analytical stage begins with the serial creation of dilutions by inserting 25 grams of pureed samples into 225 mL of Buffer Pepton Water (BPW) solution to prepare a 10^{-1} dilution, then homogenizing by vortexing. A total of 1 mL of sample from a 10^{-1} dilution is transferred into a 10^{-2} dilution tube containing 9 mL BPW and homogenized by *vortex*ing to obtain a 10^{-2} dilution solution. This stage is continued until a 10^{-8} dilution solution is obtained. A total of 1 mL of suspension from each dilution is inoculated into a Petri dish containing PCA medium, then spread with a sterile spreader rod until it dries evenly. The petri dish is then incubated at 36°C for 24 hours. Colonies that grow the next day are observed and counted manually using colony counters, with a colony count range of 25–250 colonies per cup. The formula calculates the TPC value per dilution below.

$$N = \text{number of colonies per cup} \times \frac{1}{\text{Faktor Pengenceran}}$$

Description :

N = number of colonies per gram

The TPC value per dilution is then averaged to obtain the sample TPC value.

Post Analytics

The TPC results for each sample were compared with food quality standards under

the Regulation of the Food and Drug Supervisory Agency (BPOM) Number 13 of 2019, which sets a maximum limit of microbial contamination of 1×10^6 colonies/g.The data collected consisted of observations of bacterial growth at each stage of testing. Observations were made on the level of turbidity in LB and RV media, as well as changes in color and shape of colonies in XLD media. The results of the observations were recorded in the test table and analyzed descriptively by comparing the colony characteristics with the literature and standard test results.

RESULTS AND DISCUSSION

The TPC value of the pentol is determined by counting the number of bacterial colonies that grow on PCA medium. The colony growth of 5 types of pentol on PCA medium is shown in Figure 1.

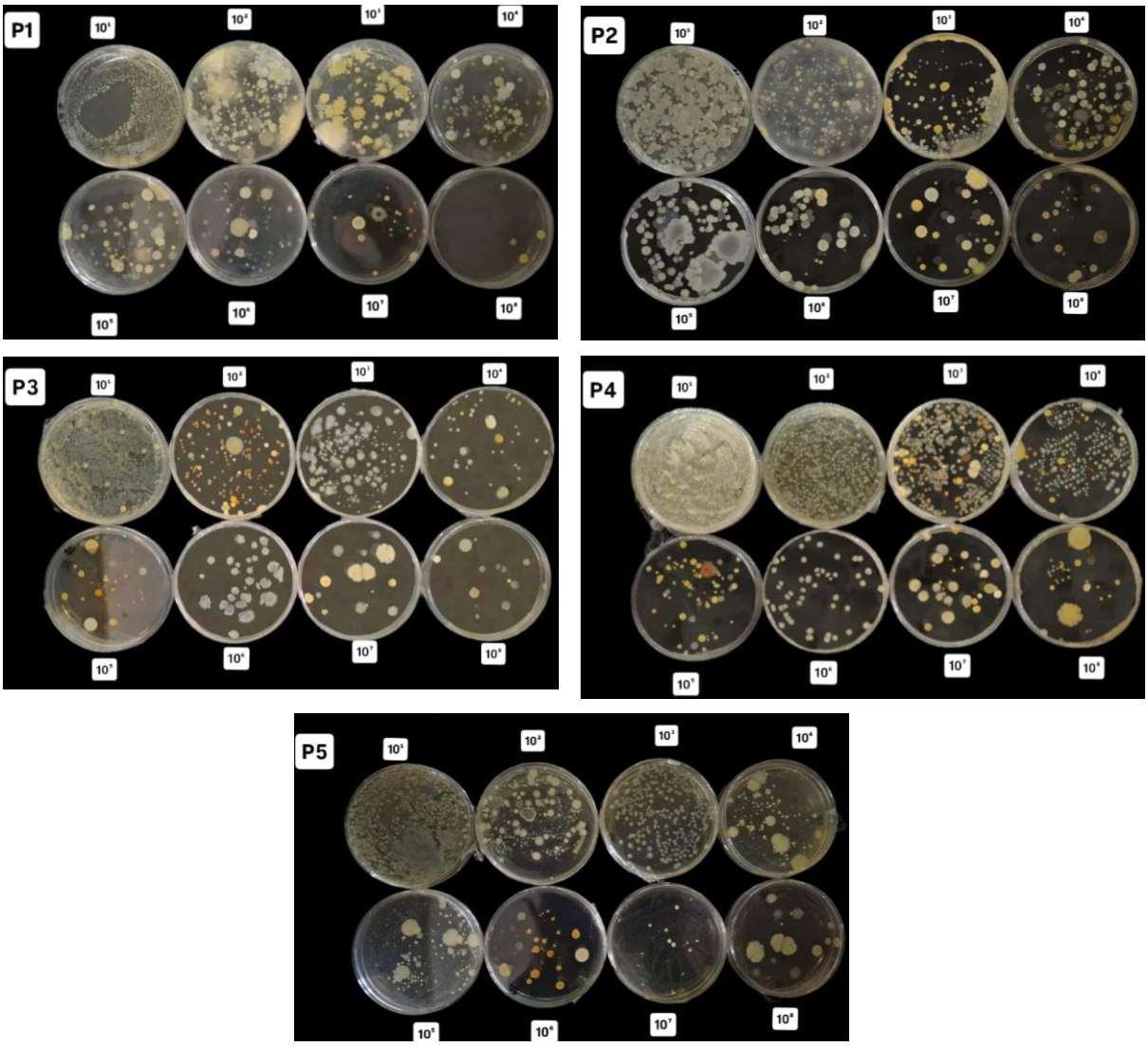

Figure 1. Growth of bacterial colonies on the media, Plate Count Agar

Table 1. Average TPC value

Sample	Average TPC Value (colony/g)	Standard Grades Quality of BPOM	Remarks
Pentol 1	1.1x107 colonies/g	1 × 106	Exceeding threshold values
Pentol 2	7.3x106 colonies/g	1 × 106	Exceeding threshold values
Pentol 3	1.5x105 colonies/g	1 × 106	Below the threshold value
Pentol 4	6.8x107 colonies/g	1 × 106	Exceeding threshold values
Pentol 5	7.9x106 colonies/g	1 × 106	Exceeding threshold values

Figure 1 shows the variation in the number of bacterial colonies across dilution levels. The higher the dilution factor, the fewer colonies grow on the PCA medium. This pattern is consistent with the principle of the stratified dilution method in the TPC test, in which the bacterial concentration is inversely proportional to the dilution rate. All pentol samples tested still showed colony growth at varying dilutions, indicating the presence of microbial contamination in each sample.

The number of colonies at each dilution level is used to calculate the TPC value in accordance with the Indonesian National Standard (SNI) 2897 of 2008, which specifies a range of 25 to 250 colonies per petri dish. The TPC value per dilution for each sample is then averaged to obtain the final TPC value for the pentol, as shown in Table 1 .

Data in Table 1 showed that four of five pentol samples had TPC values exceeding the threshold set by BPOM, while one sample was still below the safe limit. The highest TPC value was found in Pentol 4 of 6.8×10^7 colonies/g, while the lowest value was found in Pentol 3 of 1.5×10^5 colonies/g. Overall, the sample TPC value ranges from 1.5×10^5 to 6.8×10^7 colonies/g. The results showed that most of the pentol samples tested do not meet food microbiological safety standards, thereby posing a potential health risk to consumers. The results of this study are consistent with several previous studies that reported high TPC values in meat-based snacks sold in open environments.

Research by Sa'adah et al. (2021) indicates that most of the pentol samples tested had TPC values exceeding the set limit. Other studies have reported similar findings among various street food vendors across several regions in Indonesia (Yuliastuti E.S et al., 2021; Inriani et al., 2024). However, some studies have also found TPC values below the threshold, suggesting that the level of microbiological contamination is strongly influenced by the treatment and sanitation conditions in the sales environment (Haderiah & Sari, 2020; Rivaldi, 2016).

Various factors, including sanitary conditions at the point of sale, proximity to pollution sources, and unhygienic food storage, can contribute to high TPC levels in

street food. In addition, improper separation of raw and cooked materials, the presence of insects such as flies, and the use of less clean equipment can also increase the risk of microbiological contamination. The processing and storage of food after it is ripe are important factors that determine the number of microorganisms that develop in food (Wibisono, 2015).

Proper sample handling is an important factor in microbiology research because it can affect the results of the analysis. In this study, pentol samples were collected directly from the sales site and immediately placed in sterile containers to prevent cross-contamination. The sample is then stored in the Coolbox during transport to the laboratory to maintain its microbiological condition until TPC analysis is performed.

Good sample handling helps ensure that the results reflect the actual microbial contamination conditions of products circulating in the community. Sample handling from sampling to laboratory analysis needs to be considered to maintain the bacteria present in the sample (Nurfadilah et al., 2025; Sholehah & Rukaya, 2025). The high TPC value in street food is also suspected to be related to the unhygienic sample processing and management process from the beginning of collection to storage (Ainutajriani et al., 2023; Aryanti et al., 2023).

High levels of TPC in food can increase the risk of developing *Foodborne* disease, which is a disease transmitted through food contaminated with pathogenic microorganisms. Bacteria such as *Escherichia coli*, *Salmonella*, and *Listeria* can develop on food that is not processed or stored hygienically. Consumption of contaminated food can cause symptoms such as nausea, vomiting, diarrhea, abdominal pain, and fever(Rorong & Wilar, 2020; Muna, 2020). Therefore, maintaining cleanliness among food sellers, using clean running water, and implementing good hygiene and sanitation are essential to reduce the risk of foodborne illness. Sanitation is a key factor influencing the extent of bacterial contamination, as it aims to prevent bacteria from entering food products and the equipment involved in food processing. Efforts to minimize contamination can be achieved through proper personal hygiene practices and by maintaining the cleanliness of processing equipment (Sandita et al., 2025).

CONCLUSION

The results showed that the Total Plate Count (TPC) value in five pentol samples sold in the Kelapa Dua Raya area, Depok, ranged from 1.5×10^5 to 6.8×10^7 colonies/g. Based on the maximum standard for microbiological contamination set by BPOM at 1×10^6 colonies/g, four out of five

pentol samples exceeded the threshold, while one sample was still below that limit. It shows that most of the pentol samples tested do not meet food microbiological safety standards.

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