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The Chicken Slaughterhouse in Jember City, Mapping the flesh Total Plate Count, pH, Lactic Acid, and Tetracycline Antibiotics of The Chicken

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A B S T R A C T

The study's objective was to map the total plate count (TPC), pH, lactic acid, and antibiotic residues, including tetracycline, in broiler meat from the Patrang sub-district in the Jember district. The study employed a descriptive case study methodology and employed ANOVA and the BNT test for data analysis. Significant effects on lactic acid, pH, and microbiological parameters were discovered by the research. Three conventional RPAs did not contain any traces of the antibiotic tetracycline. The investigation came to the conclusion that SNI guidelines and Standard Operating Procedures (SOP) for chicken slaughter were met by the level of antibiotics, lactic acid, pH, TPC, and tetracycline in RPA in Jember City's Patrang environment.

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INTRODUCTION

The article discusses the importance of broiler meat as a source of animal protein due to its advantages such as yellowish-white, thick, tender, and flavorful meat at a cheaper price. Broiler chickens, which are genetically modified and have high productivity and fast growth, are used to produce broiler meat. The article highlights the need to ensure food safety in the production and consumption process of broiler meat, particularly regarding pH quality, lactic acid, microbiological contamination, and tetracycline antibiotics. The article also mentions that After chickens are killed, the accumulation of lactic acid in muscle tissue from anaerobic glycolysis causes changes in the pH of the flesh. The procedure for decreasing meat pH can also be caused by poor handling, packaging, distribution, storage, and increased microbiological growth. The article suggests that antibiotics should not be used as growth promoters in livestock starting in 2018 due to regulatory restrictions. The article concludes by emphasizing case study research is necessary to map the quality of broiler meat in traditional RPA in Patrang District, Jember Regency, with respect to lactic acid, pH, microbial contamination, and antibiotic residues.

METHODOLOGY

The research was conducted from June 14 to August 6, 2022, in various locations based on a specific criterion of daily broiler chicken slaughter of over 30 birds. The selection of locations for broiler meat sampling was made to represent the distribution of chickens in the Patrang and Jember Regency areas, which have three traditional RPA places. These locations are UD. Blessings, UD. Maulan, and Mr Yunus, all situated in the center of Jember city. The samples were subsequently brought to Jember State Polytechnic's Biosciences Laboratory for testing for bacteria, total plate count (TPC), and other factors, as well as pH, lactic acid, and other variables using a digital pH meter. A table describes the amount of work and travel time needed to get samples to the lab provided in the summary.

Table 1. The Amount of Work and Travel Time Needed to Get Samples to the Lab

No	List of Standard RPA	Business scale or RPA Day	Type to Lab
1	UD. Berkah	200 ekor/hari Broler	10 menit
2	UD. Maulana	100-200 ekor/hari Broiler	15 menit
3	Bapak Yunus	100-200 ekor/hari Broiler	20 menit

The research was conducted from June 14 to August 6, 2022, in multiple locations based on a certain criteria of daily slaughter of over 30 broiler chickens. The study aimed to represent the distribution of chickens in the RPA of Patrang and Jember Regency, as the area has three traditional RPA locations in Jember City's downtown. These RPAs provided samples, which were then sent to the Jember State Polytechnic Biosciences Laboratory for tetracycline antibiotics, pH, lactic acid, and bacterial analysis. A digital pH meter, the Total Plate Count (TPC) method, bioassay, and a completely randomized design (CRD) with nine experimental units and three replications were employed in the study. screening test were utilized. The study followed a descriptive analytical case study model and analyzed data using ANOVA and BNT tests.

The research materials included various equipment and supplies, such as burettes, digital scales, centrifuges, and microbiology media. Samples were taken from both broiler breast and liver in the form of 100 grams each. The study aimed to provide insights into the quality of broiler meat in traditional RPAs in Patrang and Jember Regency:

a. The formula to determine lactic acid levels using the SNI (3924-2009) method is: Lactic acid concentration (%) = (volume of NaOH used in titration (ml) × 0.1 N NaOH concentration (M) × 100) ÷ (sample weight (g) × 5)

Note: The volume of NaOH used in titration is measured in milliliters (ml), the concentration of NaOH is expressed in molarity (M), and the sample weight is measured in grams (g). The result is expressed as a percentage (%).).

$$\textbf{Asam Laktat} = \frac{mg\ asam\ laktat}{mg\ sampel} \times 100\%$$

$$\% = \frac{(V \times N)NaoH \times BM\ Asam\ Laktat}{5\ gram \times 1000\ ml \times 20/100} \times 100\%$$

pH testing

b. Procedure for determining the pH value of carp meat involves cleaning and drying the electrodes, calibrating the pH meter using distilled water buffers with pH 4 and 7, and blending 5 grams of ground carp meat using twenty-five milliliters of purified water. After inserting the electrodes into the sample, the pH value is determined using a suitable scale.The TPC procedure for broiler meat involves homogenizing 25 grams of yellow pumpkin flesh with 225 milliliters of 1% BPW solution using a stomacher. Dilutions are prepared by adding 1 milliliter of the 10-1 dilution suspension to 9 milliliters of BPW solution for each subsequent dilution (10-3, 10-4, 10-5, and 10-6). Each suspension and dilution sample are given one milliliter in a Petri dish twice, and PCA is added to each beaker containing the suspension. After rotating the mixture to incorporate the sample solution and PCA, it is allowed to harden. The plates are incubated at 34-36°C for 24 to 48 hours with the cup upside down. The number of colonies is counted in each dilution series, and the average determination is the number of bacteria per gram (CFU/gram).

$$N = \frac{\Sigma C}{(n1 \times 1) + (n2 \times 0.1)} \times d$$

Information:
N = Number of colonies / gram
ΣC = Total colonies that can be counted
n1 = Number of petri dishes in the first dilution calculated
n2 = Number of petri dishes in the second dilution calculated
d = First dilution calculated

c. Weighing five grams of meat from each sample, homogenizing it with buffer solution, and centrifuging it for ten minutes at 3000 rpm are the steps in the antibiotic residue analysis procedure. Next, the supernatant is extracted and combined 100 milliliters to one milliliter of Bacillus cereus spores. After pouring this mixture into petri dishes, the sample solution is dripped onto paper discs that are placed on the medium. Following SNI 7424 (2008) recommendations, the petri dishes are incubated at 30°C ±1°C for 16–18 hours after being left at room temperature for an hour.

RESEARCH RESULT AND DISCUSSION

Using lactic acid in chicken slaughterhouses is not explicitly mentioned in this information. However, the analysis of lactic acid content in broiler meat samples from different RPAs (rapid processing areas) revealed that the highest average value of lactic acid was found in broiler chicken meat from RPA 1, with a value of 0.14. This suggests that the activity of microorganisms in RPA 1 may be higher, leading to increased production of lactic acid and a decrease in pH value of the meat. Rapid microbial growth is also more likely to occur as pH levels decrease. These findings were reported by Oktaviana, D. (2009), who explained that as meat pH levels increase, Microbial growth will be rapid and lactic acid production will rise.

Table 2. Lactic Acid Test Values for Broiler Meat

Treatment	Down (%)	Avarege	Up	Notation
RPA 1	0.13	0.14	0.16	C
RPA 2	0.09	0.10	0.11	A
RPA 3	0.11	0.12	0.13	B

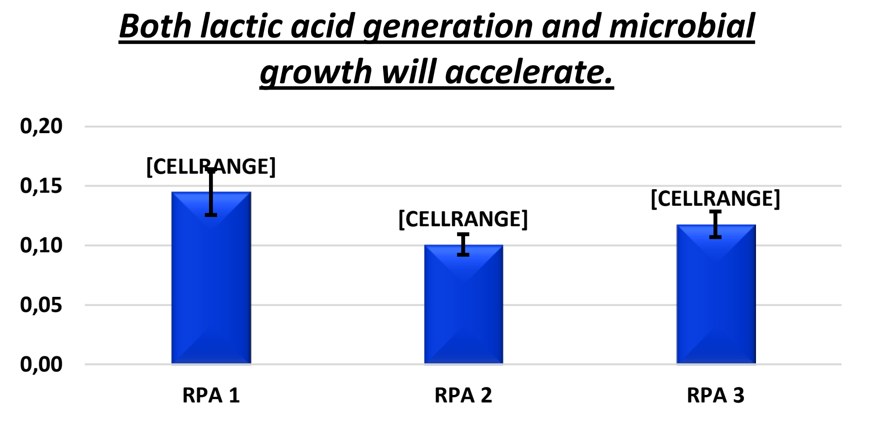


Figure 1. Average Value of Lactic Acid for Broiler Meat Based on RPA Origin

Based on the analysis of lactic acid and pH levels in broiler meat samples from different RPAs, it can be concluded that RPA 1 has the highest levels of lactic acid and lower pH values due to the resting time given to the chickens before slaughter. This step is taken to reduce the negative effects of stress caused by transportation to the slaughterhouse. The highest average pH value was found in broiler meat from RPA 2, which may be due to the quality of chicken meat causing fatigue and stress in the livestock, leading to a glycolysis process that produces lactic acid and reduces the pH value of the meat. These findings are supported by previous studies would imply for lactic acid bacteria to survive the digestion process, they need to be stable against stomach acid and resistant to bile salts. RPA 2 has the greatest average pH value of 6.50 in broiler meat, whereas RPA 1 has the lowest average pH value of 6.07, which is significantly different from RPA 2 and RPA 3. Broiler meat's pH drops from about 7.0 when it's alive to roughly 5.5–5.9 after it's killed because anaerobic glycolysis builds up lactic acid in the muscular tissue.

Table 3. pH Test Results for Samples of Broiler Meat

Treatment	**Below**	**Average**	**Above**	**Notation**
RPA 1	6.22	6.27	6.33	A
RPA 2	6.44	6.50	6.55	C
RPA 3	6.30	6.35	6.41	B

Source: Processed Data (2022)

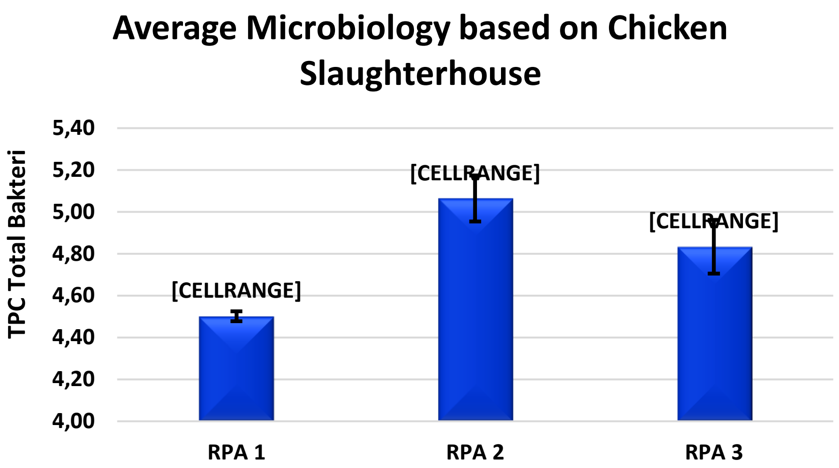
According to RPA, the broiler meat pH value test results are still within the standard range of SNI 3924-2009, which calls for a standard pH value of 6-7. RPA 2 has the greatest pH value while RPA 1 has the lowest pH value, according to a descriptive analysis of the three RPAs. The failure to replace the cleaning water may be the cause of this. The body breaks down too much muscle glycogen and builds up lactic acid, which causes the meat to become low pH, pale, mushy, and watery when it is cut. Lengkey et al. (2013).

Chicken slaughterhouse, microbiology

In microbiological testing of broiler meat samples, different RPA origins resulted in different average TPC levels (Table 4). According to the aforementioned data, microbiological at RPA 2 demonstrates this value, which is the highest and most significantly different, surpassing the TPC value at RPA 1 and RPA 3. According to variance analysis, the results of microbiological tests on broiler chicken meat were highly inconsistent. On average, RPA 1 for broiler chicken meat was 3.17 x 104, the lowest value. The flesh from the broiler chickens had a high RPA. Broiler meat may become contaminated with microorganisms because to conditions in the RPA environment. In Patrang District, every RPA is in disrepair. The flooring were completely dark, the equipment was rarely cleaned, and the roof was coated in feathers from chickens. In contrast to RPA 1, it is cleaner, with well-kept flooring and equipment. This contributes to the relatively low microbiological TPC value in RPA 1. This supports the assertion made by Syarifuddin, A. et al. (2020) that an unclean chicken slaughterhouse environment, including the knives, water, and cutting instruments used, as well as the workers themselves, can quickly lead to an increase in the overall plate count. Additionally, according to Bontong et al. (2012), if equipment is not routinely cleaned after use, meat may become infected.

Table 4. Microbiological Test Results for Samples of Broiler Meat

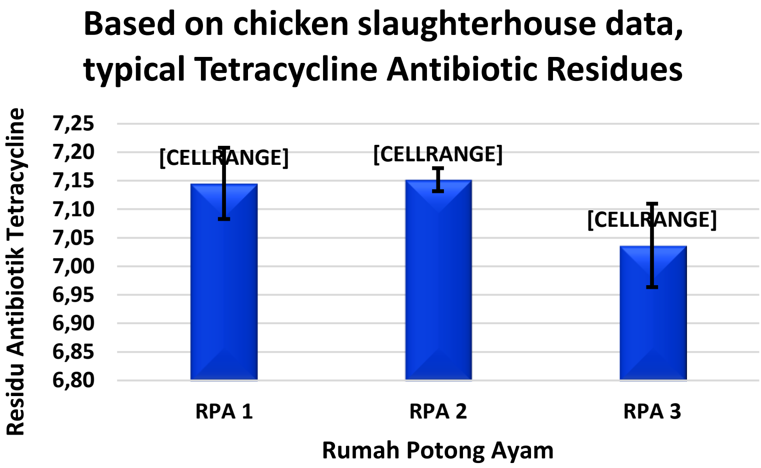
Treatment	Review			**Amount**	**Avarege**	**Notation**
	1	2	3			
RPA 1	3.05 x10^4	3.37 x 10^4	3.10 x 10^4	9.52 x 10^4	3.17 x 10^4	A
RPA 2	9.11 x 10^4	1.51 x 10^5	1.13 x 10^5	11.75 x 10^4	3.91 x 10^5	C
RPA 3	9.53 x 10^4	6.05 x 10^4	5.48 x 10^4	21.03 x 10^4	7.01 x 10^4	B
Jumlah	21.69 x 10^4	10.93 x 10^4	9.71 x 10^4			



The microbiological TPC value from microbiological testing of broiler meat samples in RPA 3 had the highest value, while RPA 1 had the lowest value. This can be attributed to the poor cleanliness practices in RPA 3, where equipment is rarely cleaned after use and water is reused, leading to bacterial contamination of chicken meat. The microbiological TPC value in RPA 1 was lower due to relatively clean floors and equipment. This is in line with previous studies that suggest poor cleanliness practices in a chicken slaughterhouse environment can lead to bacterial contamination of broiler meat (Syarifuddin et al., 2020; Bontong et al., 2012).

The investigation discovered that nine samples had no traces of tetracycline, which is relevant to the usage of antibiotics with tetracycline residues. The broiler meat samples' inhibitory zone diameter that were marketed in Jember varied between 7.11 and 7.21 mm, which is below the Maximum Residue Limit (MRL) for tetracycline antibiotics as set by SNI 01-

6366 (2009). This indicates that the use of antibiotics with tetracycline residues is still within the permitted limits in these broiler meat samples.In terms of temperature, bacteria grow faster every 30 minutes at a temperature of 25°C and pH 6.0-6.5, as stated by Morandi et al. (2005). Therefore, temperature is a crucial factor to consider when trying to limit bacterial growth (Taha, 2012). The RPA environment also plays a significant role in determining whether a piece of meat or a location will be contaminated with microbiology, as highlighted by Kurniati, N. Et al (2016)



The study found that RPA 1 had the highest average tetracycline antibiotic residue, followed by RPA 2 and RPA 3 based on three different RPA kinds are described in detail. RPA 1, RPA 2, and RPA 3 had average tetracycline antibiotic residues of 7.145 ± 0.06, 7.152 ± 0.02, and 7.037 ± 0.07 mg/kg, in that order. Tetracycline antibiotic residues in meat or food of animal origin shall not be more than 0.1 mg/kg. The degree of resistance to antibiotic bacteria is categorized based on the Clinical Laboratory Standards Institute's standards, with sensitive, moderate, and resistant being the three utilized to calculate the antibiotic inhibition zone's diameter. The bacteria may be regarded as antibiotic-responsive if they are able to be efficiently inhibited and a clear zone forms during the test. Three groups of bacteria can be classified as resistant to tetracycline antibiotics: resistant if the bacterial inhibition zone is larger than 19 mm, moderate if it is between 15 and 18 mm, and sensitive if it is less than 19 mm. Additionally, the resistance category is used if the bacterial inhibition zone's diameter is less than 14 mm. Antibiotic residues in the samples may result from giving tetracycline antibiotics in excess of what is advised or from killing calves before the allotted amount of time has passed after giving tetracycline antibiotics, which allows the antibiotics to keep building up in the body (Saniwanti et al., 2015).

CONCLUSIONS AND RECOMMENDATIONS

In terms of quality control, the study measured the Total plate count (TPC), pH, lactic acid, Standard Operating Procedure (SOP) observance, and SNI compliance standards in three traditional RPA (Patrang) in Jember city. The results showed that The pH values of RPA 1 and RPA 2 were 6.27 ± 0.06 and 6.5 ± 0.05, respectively. Each RPA 1 and RPA 2 met the SNI standard for pH, which is between 6.0 and 6.5. RPA 3 had the lowest lactic acid content at 0.1% ± 0.01, while RPA 1 had the highest at 0.14% ± 0.02, both of which met the SNI standard for lactic acid content, which is less than or equal to 1%. The TPC values for RPA 1 and RPA 2 ranged for RPA 1, from 3.17 x 104 cfu/g to 3.91 x 105 cfu/g RPA 2, both of which met the SNI standard for TPC, which is less than or equal to 7 x 105 cfu/g. The study also found that all three traditional RPA complied with SNI standards for SOP implementation.

Regarding tetracycline antibiotic residues, the study found that no traces of tetracycline antibiotics were detected in any of the three traditional RPA samples analyzed for antibiotic residues.

ADVANCED RESEARCH

The study demonstrates the absence of antibiotic residues, specifically tetracycline, in broiler meat from the Patrang sub-district in the Jember district. The findings support the effectiveness of the SNI guidelines and SOP for chicken slaughter in maintaining the quality and safety of broiler meat.

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