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STUDY ON THE QUALITY OF BROILER CHICKEN MEAT IN A MODERN MARKET IN SUKOHARJO REGENCY

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ABSTRACT

The total number of broiler chickens in Sukoharjo district was 9,134,244, with the overall provincial production in Central Java reaching 225,048,936. The quality indicators of broiler meat include water content, soluble protein and cooking shrinkage of the meat. The research was conducted in a modern market located in Sukoharjo district from Superindo, Transmat, Lottemart and Hypermart markets. Samples taken were breast part and sampled using the RAL method. The observed variables were drip loss, cooking loss, soluble protein and fat lavels.The data were analysed using analysis of variance (ANOVA) and Duncan's multiple range test (DMRT). The results of the study on broiler meat in different markets were found to be significantly different ($P < 0.01$) for dripping loss, cooking loss and soluble protein. However, no difference was observed in meat fat content ($P > 0.05$).The findings of the study indicate that the quality of broiler meat in modern markets in Sukoharjo district has an impact on drip loss, cooking loss and soluble protein, but not to any significant extent on fat lavels.

Keywords: drip loss, cooking loss, soluble protein, fat, meat quality

INTRODUCTION

The *Badan Pusat Statistik* (BPS) stated that the productivity of broiler chicken meat in Sukoharjo Regency reached 9,134,244 heads (BPS, 2018). At the central java province l, broiler chicken production in Central Java reached 225,048,936 heads, with an increase in the number of productions every year. The high level of broiler chicken production in Sukoharjo Regency shows the high market demand and public consumption of broiler chicken meat. Based on the BPS Staples Survey, purebred chicken meat consumption in 2021 is estimated to reach 10.36 kg per capita per year (provisional figure), which shows high public interest in consumption.

One of the staple consumption products is meat. Meat is a very beneficial food for humans because it contains many necessary nutrients, such as protein, fat, carbohydrates, minerals, vitamins, and water. One of the types of meat is broiler chicken, broiler chicken meat is a very popular source of animal protein in Indonesia because it is easy to obtain and process (Kementan, 2022). Therefore, people like broiler chicken meat as a source of poultry protein. In Sukoharjo Regency, broiler chicken meat is easy to find in traditional markets and modern markets. In addition to being easy to process and find, broiler chicken meat is also relatively cheaper compared to other animal protein sources such as beef, pork, or seafood.

The nutritional content in broiler chicken meat consists of 18.6% protein, 15.06% fat, 65.95% water, and 0.79% ash (Suradi, 2006). Meat is a food that is susceptible to spoilage because it contains substances that support the growth of microorganisms. The high nutritional content in chicken meat makes it easily damaged and contaminated. Broiler chicken meat available on the market every day has a varied quality, which is influenced by the condition of the livestock, the method of rearing and the age of the livestock when slau ghtered. Broiler chicken meat quality indicators include pH, moisture content, soluble protein, and cooked shrinkage. In choosing meat, it is important to pay attention to the color and smell of the meat as a sign of quality to avoid fraud, such as chicken meat that dies before cutting (tiren), chicken that is overwatered (gelonggongan), and other irregularities. This study aims to determine the quality of broiler chicken meat circulating in the modern market in the Sukoharjo Regency area.

RESEARCH METHODS

Time and Location

The research was carried out on March 11-3, 2024, at the laboratory of the Faculty of Agriculture, Veteran Bangun Nusantara University Sukoharjo.

Tools and Materials

The tools used in this study include: ovens, scales, spectrophotometers, desiccants, distillation petri cups, stirring rods, measuring tubes, baker glass, mortar, knives, label paper, plastic, yarn, filter paper and stationery.

The materials used in this research include: broiler chicken breast meat, aquades, gasoline wash, E reagent (Folin-Ciocalteu).

Research Methods

The research method used in this study was carried out by observing the chemical and physical quality of broiler chicken meat sold in modern markets/supermarkets in the Sukoharjo Regency area. namely Superindo, Lottemart, Heypermart and Transmart research was carried out by random examination with a Complete Random Design consisting of 4 samples with 5 repetitions, namely: P1: Breast meat from Superindo market, P2: Breast meat from Transmart market, P3: Breast meat from Lottemart market, P4: Breast meat from Hypermart market

Observed Variables

Drip loss examination test. According to Prabawa, *et al*., (2021), *the* drip loss examination is carried out in the following way: Weighing 5 grams of meat. Hang the meat into the plastic arrange it so that it does not touch the plastic wall. Hang the meat in the refrigerator (7ºC) for 24 hours, then remove it from the refrigerator and dry the surface of the meat using paper towels slowly. Considering the results of the treatment.

Calculate the test value of drip loss % with the formula.

Drip loss value % = $\frac{A-B}{A}$ X 100%. A= weight of the initial sample. B = weight of the sample after final treatment

Cooking loss check test. The cooking loss check is carried out in the following way: Cut and weigh 100 grams of meat. Put it in a plastic bag and remove the air in the plastic. Water heat 75ºC. Put a plastic bag containing meat in the bath for 50 minutes and run the water for 40 minutes. Drain the meat by wiping the surface with a tissue. Weigh the meat back and do the math.

Cooking *loss* value test count % = $\frac{A-B}{A}$ x 100%. A= weight of the initial sample. B = weight of the sample after the final treatment.

Soluble protein content test, Protein content measurement by the AOAC spectrophotometry method (1995) is carried out in the following way: a) Standard curve creation: Prepare 6 test tubes. Standard solutions with volumes of 0, 0.2, 0.4, 0.6, 0.8, and 1 ml are prepared, then diluted with aquades until they reach a volume of 1 ml. Each tube is then added 1 ml of D solution and homogenized using a vortex, incubated at room temperature for 15 minutes. Next, 3 ml of reagent E (Folin-Ciocalteu) was added to each tube, re-homogenized with vortex, and incubated at room temperature for 45 minutes. The absorbance of the solution was measured at a wavelength of 540 nm using a spectrophotometer. The standard curve is created by relating the absorbance value to the concentration of the solution. b) Determination of soluble protein content: Blend 2 grams of sample to which 10 ml of aquades is added with mortar. Then dilute 1000x by inserting 1 ml of sample and adding aquades up to a volume of 1000ml. Prepare 10 test tubes and fill them with each sample solution. Each tube is added 1 ml of solution D, homogenized with vortex, and incubated at room temperature for 15 minutes. Then, 3 ml of reagent E (Folin-Ciocalteu) was added to each tube, re-homogenized with vortex, and incubated at room temperature for 45 minutes. The absorbance of the solution was measured at 540 nm using a spectrophotometer to determine the dissolved protein content based on a standard curve equation.

Test the fat level. The fat content of carcass can be analyzed using the AOAC soxhlet extraction method (1995). The steps to measure the fat content are as follows: Weigh the sample by 2 grams and bake at 105°C for 24 hours. Put the sample in the desicator for 10 minutes, then weigh it (W). Cut a 7 x 5 cm piece of filter paper and steam the sample with the filter paper, then tie it with thread and weigh it

again (W1). Put the sample into the distillation device, filter it with a gasoline wash, and aerate it. Bake again for 6 hours at 105°C. Put the sample in the desicator for 10 minutes, then weigh it (W2).

Fat percentage can be calculated using the formula:

$$\text{Meat fat content} = \frac{w1-w2}{w} \text{ X } 100\%$$

W= dry sample weight, W1= starting weight, W2= final weight

Data Analysis Methods

The collected data were analyzed using (Anova. If there is a significant difference between the treatments, a Duncan Multiple Range Test (DMRT) will be performed to evaluate the differences between each treatment.

RESULTS AND DISCUSSION

Drip Loss

The analysis of various fingerprints showed which can be seen in table that the results of the Drip loss test in different modern markets were very significant (P<0.01; see Tabel 1). The highest Drip loss value is found in the modern market P2 (Transmart) with a value of 9.01% and the lowest value is found in the modern market P4 (Hypermart) with a value of 6.42%. Drip or the amount of fluid that comes out of the muscle/meat during the storage period is one of the indicators that determine the physical quality of broiler chicken meat, the Drip loss value is related to the water binding power in the meat, the more liquid that comes out, the lower the ability of the muscle/meat to bind water. A high drip loss value indicates the amount of water and nutrients that come out of the meat and the occurrence of protein denaturation. (Prasetyo et al., 2021)

Based on the DMRT follow-up test, it can be concluded that. P1 (Superindo) showed a significant difference to P2 (Transmart), which was 7.28% and 9.01% in the treatment of P3 (Lottemart) and P4 (Hypermart), there was no significant difference, namely 7.52% and 6.45%. The inability of muscles to retain water in it is influenced by the destruction of nutrients in the form of protein in the meat so that the meat cannot maintain itAccording to research by Kato et al. (2013) The rate of water loss drip loss in chicken meat does not exceed 6%. The high drip loss value in the modern market in the modern market in Sukoharjo district is influenced by the cooling factor, the meat sold in the modern market in Sukoharjo is generally treated in cold conditions or in a frozen state according to the statement. (Wanniatie et al., 2014) The storage time and length affect the drip value of the meat, the rate of freezing and the formation of ice also determines the amount of drip.The Drip loss value is also influenced by the slaughter before and after the slaughter/slaughter process of broiler chicken meat. Stressed chickens have an increased drip loss value in broiler chicken meat Prasetyo et al. (2021) Stressed chickens can accelerate the process of rigor mortis and protein denaturation. Protein denaturing results in a decrease in the ability of proteins in meat to bind water, which causes the structure of the meat to open so that the meat will experience increased water loss or drip loss (Rini et al., 2019).

Broiler chicken meat in the modern market has undergone a cooling phase when it is in storage, this can also increase the value of drip loss of broiler chicken meat, this is in accordance with the statement of Rahim (2009) the longer the meat is stored, the more liquid is produced. A low drip loss value indicates that the water and nutrient content in the meat are still in good condition, and the good nutrient content in the form of protein helps bind water to the meat.

Cooking Loss

The analysis of the fingerprint showed that the testing of cooking loss of broiler chicken meat in the modern market in Sukoharjo Regency showed a very significant difference (P < 0.01). The test results of P1 (Superindo) were 21.04%, P2 (Transmart) was 20.87%, P3 (Lottemart) was 15.48% and P4 (Hypermart) was 17.79%. (see Tabel 1). Cooking loss is the amount of liquid that comes out during the heating process in a certain time, the cooking loss value can be used as one of the checks for moisture content in meat. The value of cooking loss is affected by the length of the meat heating process Dewayani et al. (2015) The long heating period with constant temperature will make the meat release a lot of water, in the heating process it can denature proteins and damage the connective tissue in the meat, which causes the physical changes of the meat so that the meat

loses its ability to bind water which causes the meat to release a lot of water, so that the meat will lose its muscle mass.

Based on the stastical analysis results of DMRT's follow-up test, it can be concluded that P1 (Superindo) 21.04% is significantly different from P2 (Transmart) 20.87% while the P3 market (Lottemart) 15.45% does not show a significant difference with P4 (Hypermat) 17.79% (see Tabel 1). The time span of boiling meat in the meat cooking depreciation value test can affect the results of the cooking shrinkage test on chicken broiler meat, this is in accordance with the statement of Prasetyo et al. (2012) meat that is cooked for a long time can affect the amount of water that comes out of the meat during the boiling process which will result in a decrease in water content, the longer the boiling will bind the amount of water that comes out of the meat. Ripeness shrinkage is affected by temperature during the cooking process; The higher the temperature used, the more liquid is released during the cooking process. In addition, cooking shrinkage is also affected by the ability of meat to bind water (Biyatmoko dan Sulaiman, 2018) Meat in different markets has different qualities, this is influenced by the way the meat is maintained, slaughtered and handled after slaughter, so that meat has different water-binding ability in each market.

A low cooking loss value means that the less water comes out and the nutrients dissolved in the meat cooking process, on the other hand, if the high cooking loss value indicates the amount of water and the most marine nutrients that come out of the meat Prayitno et al., (2012). The results of the study show that the cooking loss value of chicken meat is 17.98%-21.02% which is classified as low/normal which is in accordance with the story of Mega et al., (2016) The cooking loss value is generally in the range of 1.5 to 54.5%, with a special value of cooking loss ranging from 15 to 40%. In this study, the four markets have the results of the cooking loss test in good condition, which means that the nutritional content in the meat can still be maintained.

Table 1. Flattening drip loss, cooking loss, soluble protein, and fat content of meat broiler in modern market in Sukoharjo regency

Parameter	Treatment				P value
	P1 (Superindo)	P2 (Transmart)	P3 (Lottemart)	P4 (Hypermart)	
Drip loss (%)	7.28 ^{a}	9.01 ^{b}	7.52 ^{a}	6.42 ^{a}	<0.01
Cooking loss (%)	21.02 ^{a}	20,87 ^{b}	15,48 ^{a}	17.79 ^{ab}	<0.01
Soluble protein (%)	1,05 ^{a}	1,88 ^{bc}	1.71 ^{b}	2.56 ^{c}	<0.01
Fat content ^{ns} (%)	1,00	0,99	0,95	0,98	>0.05

Different superscripts on the same line show differences between (P<0.01)

Soluble Proteins

Based on the analysis of various fingerprints, the results of testing soluble protein of broiler chicken meat in the modern market in Sukoharjo Regency showed a very real difference (P<0.01). Soluble protein is one of the components that can be dissolved with the water that comes out of Drip, which is composed of oligopeptides that are less than ten amino acid chain arrangements. The test results in each modern market in Sukohoarjo district are P1 (Superindo) by 1.05%, P2 (Transmart) by 1.88%; P3 (Lottemart) by 1.71% and P4 (Hypermart) by 2.56%. The highest praise results were obtained in the P4 modern market (Hypermart) and the lowest in the P1 market (Superindo) (see Tabel 1). This result was obtained from a sample of broiler chicken meat obtained under the condition that the sample was in a special storage place for meat that had a cooler temperature accompanied by ice, when bringing the sample to the laboratory there was a change in temperature so that the meat would automatically release the drip along with the nutisi in it, this was in accordance with the statement of Prihatiningsih et al. (2020) Temperature affects the decrease of soluble protein during thawing, not only the thawing process, the freezing process can also affect the meaning of other meat quality. The denaturation that occurs in meat protein will decrease the value of soluble protein in broiler chicken meat which causes the release of protein content along with drip, the water that comes out is the inability of the muscles to reabsorb the water that comes out.

According to Alyani et al. (2016) Protein denaturation is a process in which a change or modification occurs to the protein confoemation which more precisely occurs in the tertiary and kruartner structures of proteins, so that covelent bonds break down. Damaged proteins cause the water binding power of the meat to decrease, resulting in high drip.

Based on DMRT's follow-up test, it can be concluded that the P1 (Superindo) market of 1.05% is significantly different from P2 (Transmart), P3 (Lottemart) and P4 (Hypermart), namely 1.88%, 1.71%, and 2.56%. A good soluble protein pool is found in P4 (Hypermart) 2.56%.. The value of soluble protein is related to the physical condition of broiler chicken meat, meat with good physical condition has the ability to maintain the nutrients contained in it. Soluble protein levels are related to water binding power in meat High protein levels indicate that muscles will release water and nutrients a little this is in accordance with (Nur dan Sari , 2020) Protein has a function to bind water in muscles, so that the more protein is bound, the more water can be retained.

Fat Content

The analysis of various fingerprint results of testing the fat content of broiler chicken meat in the modern market in Sukoharjo district did not show significant differences. The results of the fat content test were P1 (Superindo) by 1%, P2 (Transmart) by 0.99%, P3 (Lottemart) by 0.95% and P4 (Hypermart) by 0.98% (see Tabel 1). The fat content of broler chicken in the breast has a lower fat content than in other parts of the body of broiler chicken, this is in accordance with the statement of Susanty et al. (2021) through the observation of proximate analysis, especially in the content of carbohydrates, fat and protein in the thighs has a lot of carbohydrates and fat, while the breast contains more protein. The breast is the part of the broiler chicken's body that has a larger otid period so that the most meat fat is at the bottom of the skin of the chest muscles.

Fat content is also affected by the age of the chicken; The older the chicken, the fat content in broiler chicken meat tends to increase. Sex can also affect the fat content in broiler chicken meat, with male broiler chickens having lower fat levels, while hens tend to accumulate fat more quickly. (Estancia, et al., 2012).

Meat that has a high protein content generally has a low fat content. The protein content affects the fat content in meat, with an inverse relationship: the higher the protein content, the lower the fat content, and conversely, the higher the fat content, the lower the protein content. This explanation is consistent with this statement. (Hidayah et al., 2019). The fat content in broiler chicken meat has an inverse relationship with its protein content. In addition, the fat content in broiler chicken meat is affected by the method of maintenance and the type of feed given. Feeding with excess energy can accelerate the accumulation of fat in the chicken's body, including in the organs and skin tissues.

CONCLUSIONS

Based on the results of research on broiler chicken meat chemically and physically in different modern markets (Superindo, Transmart, Lottemart and Hypermart) have a very significant difference in influence on drip loss ($P>0.01$), Cooking loss ($P>0.01$) and the seafarest protein ($P<0.01$) of meat chicken broiler, but do not have a significant effect on meat fat cotent ($P<0.05$) of meat chicken broiler.

SUGGESTIONS

For the next study, the researcher recommends to get good test results, it is necessary to carry out good sampling and handling techniques, considering the distance between different markets and sample testing locations. It needs to be done properly so that the sample can be maintained and the results of the submission are in accordance with what is expected**.**

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