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EFFECT OF BOILING COCONUT WATER ON PHYSICAL, CHEMICAL AND ORGANOLEPTIC PROPERTIES OF REJECTED LAYING HEN

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Abstract

Rejected Laying Hen (RLH) meat has a low quality due to slaughtered at a relatively old age causing the tenderness of meat to be low and less desirable by the public. Improving nutritional quality and elevating the level of people`s preference for chicken meat that have been done by innovating and diversifying into RLH, one of which was using boiled coconut water. The purpose of this study was to determine the effect of boiled coconut water on physical, chemical and organoleptic properties of RLH. The Completely Randomized Design Method with four treatments (boiling time of 15, 30, 45 and 60 minutes) with four repetitions was used as an observation variable which included physico-chemical tests (tenderness, cooking losses, water holding capacity (WHC), water content, protein content and fat content) and organoleptic tests. Physical-chemical and organoleptic tests of this study showed that there were significant differences in the duration of boiling. The range of cooking losses was 33.60 - 38.92%; tenderness value 5.54 - 6.13; and WHC ranges from 38.21 - 40.42. While the water content ranges from 67.26 - 69.09%, Protein ranges from 16.24 - 16.89%, and Fat ranges from 10.11 - 11.72%. Organoleptic test values range from 4.05 - 5.05. The conclusion of this study shows that the physical-chemical and organoleptic properties of RLH with boiling coconut water for 60 minutes have been able to maintain the quality of RLH and organoleptic tests were acceptable.

Key words*: boiling, coconut water, Rejected Laying Hen (RLH)*

INTRODUCTION

Meat as a perishable food was very easily damaged. Rejected Laying Hen (RLH) has nutritional and high biological value were good as food source. The nutritional content was easily digested and absorbed by the body. Meat consumption and products have increased from year to year. The rejected chicken was known as a laying hen that was no longer productive has a body weight range from 2 to 2,5 kilogram and the age was ranged between 18 to 20 months old. The low carcass quality with relatively high fat content, but has good connective tissue (Murtidjo, 2003), was confirmed by Purnamasari (2012) that the low quality was due to late cutting time so that the tenderness of the meat becomes less and was not liked by the public. Therefore, to increase consumer interest in RLH, there needs to be innovation and diversification by boiling chicken meat into coconut water.

Old coconuts contain high calories in the amount of 359 calories per 100 grams; Half-aged coconut contains 180 calories per 100 grams and young coconut meat contains 68 calories per 100 grams. The average calorie value of coconut water was 17 calories per 100 grams where green coconut water contains tannin or antidote (anti-poison) higher than other types of coconut. The composition of chemical substances found in coconut water includes ascorbic acid or vitamin C, protein, fat, carbohydrate, calcium or potassium with mineral content such as iron and phosphorus and sugars such as glucose, fructose and sucrose (Alexia et al., 2012). While coconut has a water content of 95.5 per 100 grams of coconut meat (Directorate of Nutrition of the Ministry of Health Republic of Indonesia, 1981).

According to Kailaku et al. (2016), states that coconut water has a total sugar content of 6.06%, potassium levels 1,736.46 mg/kg, sodium levels 14.17 mg/kg and clarity of 97.4%. Coconut water has good nutritional value and is efficacious in reducing the frequency of heart rate and blood pressure which states that the blood pressure of hypertensive patients who

routinely consume coconut water drops to 71% (Paramitha and Budiman, 2018), as a refreshing drink, anti-rehydration and as a natural drink with the main content of sugar and minerals (Chathuri et al., 2018). In addition, according to Geetha et al. (2016), coconut water functions as an antioxidant also contains 5.2% protein, 53.5% carbohydrates, 2.6% phenolic and 1.4% flavonoids. Furthermore, Yong et al. (2009) states that coconut water contains acetic acid and citric acid.

Based on the above considerations, the study entitled 'Effect of boiling coconut water on physical, chemical and organoleptic properties in Rejected Laying Chicken Meat, was conducted'.

This study aims to measure cooking losses, tenderness, water holding capacity, water content, protein content, fat content and organoleptic properties of rejected chicken meat after boiling with coconut water.

MATERIALS AND METHODS

The thighs and breasts of the RLH that were clean from feathers and offal weighed 1000 gr for each treatment into 3000 ml of coconut water immersion, then boiling for 15, 30, 45 and 60 minutes.

Knives, measuring cups, analytical scales, stopwatches, thermometers, ovens, desiccators, Erlenmeyer tubes, panic, gas stoves and stationery are tools used in this study.

This study uses a completely randomized design (CRD) with 4 levels of treatment with 4 replications. The treatment was the length of boiling meat in coconut water with 4 levels of treatment, namely:

A1 = Cook meat for 15 minutes
A2 = Cook meat for 30 minutes
A3 = Cook meat for 45 minutes
A4 = Cook meat for 60 minutes

Retrieval of data from the physical-chemical test observation variables were tenderness, texture, water holding capacity, cooking losses, water content, protein content, fat content, carbohydrates and organoleptic tests.

Rejected laying chicken meat that has been cleaned from feathers and offal was taken 1000 grams of thighs and breasts for each treatment and soaked with 3000 ml of coconut water, then boiled for 15, 30, 45 and 60 minutes at a temperature of 90 to 100 degrees Celsius for further analysis.

RESULTS AND DISCUSSIONS

A. Physical Characteristic.

The results of the study on the effect of coconut water boiling time on cooking losses, tenderness, WHC were shown in Table 1.

The results of the statistical test of cooking losses shown in table 1 show that the boiling time in coconut water showed a significant difference ($P<0.05$) to the cooking losses of the rejected chicken meat. With the Honestly Significant Difference test (BNJ) with the aim to see the difference in each treatment, namely between chicken meat which was boiled for 15, 30, 45 and 60 minutes. According to Soeparno (2005), cooking losses were closely related to protein content, juiceness and water holding capacity. The higher the protein, the lower cooking losses where meat with low cooking losses will be better.

The percentage of cooking losses in this study ranged from 33.60-38.92%. The effect of boiling on the water content causes shrinking of the meat because the water was released from the meat also because of evaporation during boiling. The effect of increasing the temperature and cooking time makes the value of cooking losses as an indicator of meat nutrition associated with meat juice levels, namely the amount of water bound in and between the muscle fibers. Meat with lower cooking shrinkage values illustrates better nutrient quality due to the low nutrient loss during the cooking process. The high value of the water holding capacity (WHC) will result in low cooking losses. The longer the cooking time with the same temperature, causing an increase in cooking losses and tenderness. Animal age factors affect meat tenderness, namely the muscle, meat composition, myofibril structure, connective tissue content and the degree of cross-linking in addition to the ability of the WHC by protein and meat juice (Soeparno, 2005).

Tenderness of rejected chicken meat in this study ranged from 5.54 to 6.13. Meat quality after cooking affects the physical character of chicken meat. Aberle et al. (2001) stated that the connective tissue group, the meat fiber group,

and the fat group related to muscle were the components that affect the tenderness of meat but Wahyuni et al. (2018), states that beef marinated with coconut water in 90 minutes has not been able to influence water holding capacity and tenderness.

Table 1. The mean values of cooking loses, tenderness and WHC

Parameter	Length of Boiling Meat (minutes)			
	15	30	45	60
Cooking Loss (%)	33.60 ± 0.20^{a}	37.52 ± 0.12^{c}	37.78 ± 0.02^{b}	38.92 ± 0.24^{d}
Tenderness (mm/g/s)	5.54 ± 0.20^{a}	5.76 ± 0.12^{b}	5.94 ± 0.15^{c}	6.13 ± 0.12^{d}
WHC (%)	38.21 ± 0.05^{d}	39.28 ± 0.05^{c}	41.13 ± 0.05^{b}	40.42 ± 0.05^{a}

Remarks: different notations show significant differences between treatments ($P<0.05$)

Water holding capacity in this study varied 38.21-40.42%. Duration of boiled chicken meat with coconut water affects the water holding capacity. The longer the boiling time, the more the binding capacity of the water. The process of cutting, heating, grinding and pressure can affect the holding capacity of the water. Low WHC causes the meat to lose a lot of water, resulting in weight loss and dissolved components of the water. Warming at a temperature of 600 degrees Celsius results in almost complete denaturation of sarcoplasmic proteins (Lawrier, 2005).

B. Chemical Characteristic

The mean value of the results of chemical analysis of rejected chicken meat was shown in Table 2.

Based on the data in Table 2. the water content of rejected chicken meat obtained an average value of 67.26%-69.09%. Coconut water has the ability to maintain the water content of rejected chicken meat, this was due to the presence of organic acid content, namely acetic acid (Othaman, 2014). Meat moisture content has decreased due to heating or boiling. Decreased water content due to shrinkage of meat causes much water to be released out of the meat to be strengthened by the influence of coconut water which contains acetic acid which was able to pull water out of the meat tissue so that the water content of the boiled meat drops. Boiling using coconut water can form a gel layer on the meat.

Based on the data in Table 2, the results of the analysis of fat content during boiling with coconut water obtained an average value of 10.11-11.72%. Laying chicken meat during boiling with coconut water at high temperatures was able to hydrolyze the fat content that causes meat fat levels to fall. The longer the boiling time with coconut water, the lower the fat content of meat. According to Sundari et al., (2015), boiling affects the decrease in fat content because the nature of the fat that cannot stand the heat will melt and evaporate (volatile). The content of acetate in coconut water coupled with heating at high temperatures was able to hydrolyze the fat content in meat.

Test the protein content in RLH meat obtained an average value of 16.24-16.89%. presented in Table 2. The results of ANOVA showed that the boiling time with coconut water had a significantly different effect ($P<0.05$) on the protein content of rejected chicken meat. Changes in protein after boiling were denaturation, loss of enzyme activity, changes in solubility, discoloration and breaking of peptide bonds. (Sundari et.al. 2015).

Table 2. The mean value of the results of chemical analysis of RLH

Parameter	Length of Boiling Meat (minutes)			
	15	30	45	60
Water Content (%)	69.42 ± 0.17^{a}	69.09 ± 0.08^{b}	68.69 ± 0.21^{b}	67.26 ± 0.08^{c}
Protein (%)	16.24 ± 0.37^{a}	16.84 ± 0.09^{a}	16.68 ± 0.12^{c}	16.89 ± 0.13^{d}
Fat (%)	11.72 ± 0.02^{d}	10.93 ± 0.20^{c}	10.23 ± 0.02^{b}	10.11 ± 0.24^{a}

Remarks: different notations show significant differences between treatments ($P<0.05$)

C. Organoleptic Test

The results of the organoleptic test analysis of rejected chicken meat with boiling water 15, 30, 45 and 60 minutes were shown in Table 3.

The panelist rating score for organoleptic is 7 (very likes), 6 (likes), 5 (somewhat likes), 4 (neutral), 3 (somewhat dislikes), 2 (dislikes), and 1 (very dislikes).

Organoleptic assessment was used as a determinant test of quality in consuming rejected chicken meat. The results of the analysis showed no significant difference in the length of boiling of color, aroma and taste (Table 3). According to Lawrie (2005), one of the parameters in assessing flavor was the odor or aroma test. Soeparno (2005) also states that flavor was one of the factors that influence the level of liking. Long boiling chicken meat with coconut water gave significantly different results ($P<0.05$) on texture and tenderness. Boiled water can cause hydrolyzed protein and fluid exudation (free water, mobilized water and gaps of meat liquid) so that the meat becomes hard and dry (Nuhriawangsa, 2004). The pale color of chicken meat due to the amount of free water released from meat fibers in the form of the ability of high extracellular water content can reflect light so that the level of light absorption and color intensity also decreases (Miskiyah et al., 2017).

The results of the study reported by Prasetyo (2014), that the length of boiling chicken meat with coconut water made the best processed shredded meat in 30 and 45 minutes. Immersion of coconut water on chicken carcasses tends to affect the texture of the chicken becomes softer at room temperature storage (Mishiyah et al., 2017).

Processing of RLH with coconut water was able to overcome the problem of toughness to become more tender without reducing the nutritional value of meat. According to Guan et al. (2013), stated that 72 weeks old chicken meat was harder than other types of poultry and has a lower sensory score. The longer the boiling time with coconut water, the smoother the texture and tenderness level.

Table 3. Mean of RLH meat organoleptic value

Parameter	Length of Boiling Meat (minutes)			
	15	30	45	60
Colour	4.52 ± 0.02^{a}	4.43 ± 0.02^{a}	4.33 ± 0.02^{a}	4.14 ± 0.02^{a}
Aroma	4.95 ± 0.20^{a}	4.90 ± 0.01^{a}	5.19 ± 0.14^{a}	5.05 ± 0.20^{a}
Taste	4.57 ± 0.02^{a}	4.70 ± 0.10^{b}	4.57 ± 0.10^{c}	4.71 ± 0.10^{d}
Texture	4.67 ± 0.02^{a}	5.05 ± 0.20^{a}	4.19 ± 0.02^{a}	4.81 ± 0.20^{a}

Remarks: different notations show significant differences between treatments ($P<0.05$)

CONCLUSIONS

The results of the physical and chemical values of the RLHs on cooking or boiling in 60 minutes can maintain the quality of RLH meat and organoleptically acceptable.

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