



Analysis of thigh Death Chicken by Shear Values and Impedance Approach

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Abstract

Experiments were conducted to determine whether thigh meat from death chicken can be identified through Warner-Bratzler (WB) shear value and using the impedance value. Thirty of thigh meat (*Biceps femoris*) were obtained from commercial slaughtering house classified into three groups namely halal slaughtered healthy chicken (AHS), slaughtered death chicken (AMS), and slaughtered stressed chicken (ALS). *Biceps femoris* muscles were used to microscopic procedures and to assess WB score values and impedance values. This study showed that shear values of AMS thigh meat were lower than AHS and ALS after 5 and 9 h PM. This study indicated that the impedance value of AMS were significantly lower ($P < 0.05$) than AHS and ALS, it can be used to distinguish between halal thigh and the thigh meat from slaughtered death chicken.

Key words: muscle fiber, death chicken, impedance

Background

One of the pressing issue in animal's food today is the selling of the chicken meat that derived from death chickens, known as *tiren* which is often occurred in cities in Indonesia (Purnama 2004). Not only does this activity exceptionally dangerous in terms of health, but also in Islamic law. Thus, detection to determine carcass of *tirens* based on organoleptic and visual observations were create difficulties when its no longer in form of whole carcass.

In some studies, the parameter of meat quality such as meat tenderness value (Warner-Bratzler) can be used as an indicator (Fletcher et al. 2000; Khan 2000). Yet, the data that showed the differences to parameter was still none. So far, the assessment of breaking aspects that compared to the microscopic has not been done to distinguish whether meat slaughtered in halal ways or derived from the death's chickens.

In addition, there is still no research that analyse thigh muscle fiber in microscopic (to differentiate both of them). So that the determination and a regulation to assess whether the thigh meat derived from death chicken or halal slaughtering have not been studied yet.

The aim of this study was to prove whether microscopic observation of thigh muscle fibers and the impedancy values can

be used as a determinant to distinguished the meat that come from death carcass or halal slaughtering.

Materials and Methods

The value measurement (Warner-Bratzler) and impedancy to thigh meat of chicken were conducted at the Laboratory of Veterinary Public Health, Veterinary Medicine Faculty, Bogor.

A total of 30 samples of chicken thigh, strains Hubbard (Broiler) which already slaughtered from 1.5 to 1.8 kg, used in this study. Samples taken directly from the slaughterhouse Pondok Rumpit, Bogor which were in three different types; chicken which is derived from halal slaughtered and healthy (AHS), slaughtered death chicken (AMS) and slaughtered stressed chicken (ALS).

The experimental design

Used in this study was completely randomized. Types of carcass was the only a single factor, while measuring of each successive variables measured at 1, 5 and 9 hours post-mortem (PM) which is derived from the same sample.

Data Analyze

Data were analyzed by One-way Anova at 95%. Then, followed by Duncan's test with Multiple Comparison using SAS®

software (SAS Institute 1988; Mattjik and Sumertajaya 2002). Pearson correlation analysis was also conducted to determine the relationship between the measured parameter (SAS Institute 1988).

Statistical analysis was aimed to observe whether the observation value of Warner-Bratzler (WB) and the impedance of the chicken thigh meat can be used as an indicator to distinguish the meat that comes from death carcass or halal slaughtered. The parameters were WB value and impedancy value.

Tenderness Score

WB test of thigh meat (*M. biceps femoris*) was performed in accordance to the method of Warner-Bratzler of Instron™ which slaughtered at 25 °C room temperature and 250 mm/min in velocity by 2 times of repetitions. The measurement result was the value of tenderness or WB test (kgf / cm²) (Fletcher 1999; Kerth et al. 2003).

Measurement Value of Impedancy

Impedancy meter was used to measure the values. This tool is a modified standard's which can generate current electricity (*alternating current*). The values were recorded after the sensor of electrode inserted into the muscle at 1-2 cm, followed by muscle fibers direction, and between two ends of the electrode constant at 2 cm. Impedancy value was set after 5 times of repetitions. It was done to avoid any errors, and The rated of impedances expressed by ohms (Ω).

Results and Discussion

Tenderness Value of Meat

Based on WB value, the tenderness of meat on AMS was significantly higher at 1 PM and softer after 5 and 9 PM. This showed that both slaughtered healthy chickens and in weak condition did not show a significant difference to the tenderness of meat. In contrast, chickens that had died slaughtered in which the value of tenderness at 5 and 9 PM were lower than the value of tenderness at AHS and ALS (2.2 and 1.9 kgf / cm²) (Table 1).

This illustrated that after at 9 PM, the texture of thigh meat carcass became softer. The fact was closely related to the possibility of autolysis process with more faster in death chicken carcass. It was caused by a couple of reasons; called blood retention in the vascular tissue and out of vascular tissue, then the blood components will trigger autolysis process. Histochemically, chicken's thigh contains many red's muscle which is softer than chest's muscles. According to Razali et al. (2007) microscopically, the death chicken carcass was showed the damming of blood in the arteries, venules and capillaries (characterized by the presence of erythrocytes).

Table 1. Mean and standard deviation ($\bar{X} \pm SD$) values of thigh meat tenderness

Treatment	Tenderness value of thigh meat (kgf/cm ²)		
	1	5	9
AHS	4.2 ± 0.3 ^b	3.4 ± 0.4 ^a	2.7 ± 0.3 ^a
AMS	6.3 ± 1.4 ^a	2.2 ± 0.5 ^b	1.9 ± 0.3 ^c
ALS	4.1 ± 0.4 ^b	3.4 ± 0.4 ^a	2.3 ± 0.6 ^b

^{a-c} different superscripts in the same column that indicated significant differences (P <0.05)

In Table 1, it can be said that first hour of post mortem, the thigh meat derived from death chicken carcass was showed higher of 6.3 kgf / cm². In other words, the thigh muscle of death chicken was not responsive. But, these conditions will quickly changed after at five and nine hours of post mortem. At five-hours, the thigh muscle had responded softer of 2.2 kgf / cm². Likewise, after at nine-hour, the value was already at 1.9 kgf / cm². These Observations were very consistent to Kranen et al. (2000), that after cell lysis, permeability of blood vessel walls will damage and loss. As a result, the erythrocytes will be out of the vascular system to the intermuscular (tissues) and haemoglobin will be separated from erythrocytes as well. So that, it will accelerate thigh muscle more softer, primarily from the death carcass. These were very opposite if we compared with thigh muscle from live chickens in halal slaughtering.

Impedancy Score

Based on the results of impedancy value of breast meat and thigh meat, in microscopic, (both muscle fibers, tissues and vascular system AMS) showed that impedancy value was significantly lower than AHS and ALS. This phenomenon was not fully understood but based on some publications stated that the changes of electrical muscle is closely linked to the changes of volume and ionic intracellular compositions. Then, ultimately affect the reduction of electrical conductivity in tissue (Table 2).

Table 2 Impedancy rate of thigh muscles of AHS, AMS and ALS measured at 1, 5 and 9 hours postmortem

Measurement	Impedancy value (ohm) of thigh muscles from								
	AHS			AMS			ALS		
	1	5	9	1	5	9	1	5	9
	Hour (PM)			Hour (PM)			Hour (PM)		
1	1.8	1.9	1.8	1.1	1.2	1.2	1.6	1.4	1.8
2	2.2	1.9	1.8	1.4	1.3	1.2	1.7	1.3	1.7
3	2.1	2.2	1.7	1.1	1.2	1.1	1.6	2.1	1.6
4	1.8	2.1	2.0	1.2	1.3	1.2	1.6	1.4	1.6
5	1.8	2.3	1.9	1.3	1.1	1.1	1.7	1.7	1.6
6	1.9	2.0	1.9	1.2	1.2	1.1	1.5	1.8	1.6
7	1.9	1.9	1.8	1.2	1.4	1.2	1.6	1.9	1.6
8	1.9	1.8	1.9	1.1	1.0	1.1	1.5	1.8	1.5
9	1.8	2.1	2.0	1.2	1.3	1.3	1.6	1.8	1.7
10	1.7	2.2	1.8	1.2	1.2	1.0	1.7	1.9	1.5
Average ± SD	1.8 ±0.2 ^a	2.0 ±0.2 ^a	1.8 ±0.1 ^a	1.2 ±0.1 ^c	1.2 ±0.1 ^c	1.1 ±0.1 ^c	1.6 ±0.1 ^b	1.7 ±0.3 ^b	1.6 ±0.1 ^b

^{a-c} different superscripts based on same hour (PM) that indicated significant differences (P<0.05)

Conclusion

Raising of goats economically beneficial to the farmer cooperators around Rp.8.411.168,83/year, B/C ratio of 1.4, and the non-cooperator farmers around Rp.1.644.051,24/year, B/C ratio 1.2. For the farmer non-cooperators immediately pushed towards commercial purposes, so that goats are kept by the farmer gets a higher sale value in terms of the market price of a goat.

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