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BROILER CARCASS PHYSICAL CHARACTERISTICS EVALUATION BASED ON BODY WEIGHT

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Abstract

This study which aimed to determine the physical characteristics of broiler carcasses based on body weight, was done at the Laboratory of Animal Product Processing Technology, Animal Husbandry, Universitas Padjadjaran, using 25 broilers strain Coobb with body weight between 1.3 - 1.7 kg. Analysis equipment used is analytical scales, thermometers and penetrometers to observe the carcass percentage, meat percentage, tenderness, water holding capacity, and cooking losses. This study used a Completely Randomized Design (CRD) with 5 treatments of T-1 (BW 1.3 kg), T-2 (BW 1.4 kg), T-3 (BW 1.5 kg), T-4 (BW 1.6 kg) and T-5 (BW 1.7 kg). Results indicated that the treatment had significant affected (P> 0.05) the carcass percentage, meat percentage, tenderness, water holding capacity, and cooking losses.

Key words**:** *broiler carcass, carcass and meat percentage, tenderness, water holding capacity, cooking losses*

INTRODUCTION

The known origin of a product has proved to be one of the more important factors in product distinction and selection by consumers. The up and medium society today, has healthy lifestyle that demands the nutritionally food, for basic human growth and life. Broiler chicken is a food that has good nutrient content for human needs, are economics, good taste and aroma, soft texture and popular; make broiler chicken an alternative food for the society; has chemical composition of protein 18.6%, fat 15.1%, water 66.0% and ash 0.79% (Stadelman *et al*., 1988) [11]. Intensive selection for growth in broilers is associated with increased metabolic requirements and feed consumption (de Jong and Guemene, 2011) [2], and finally has effect to body weight when the broiler was slaughter. Global poultry production and consumption have grown nearly 4% over the last decade (Jez, *et al*, 2011) [4]. Poultry meat production effectiveness is influenced by many factors, such as live weight and carcass quality (Radu and Popescu-Miclosanu, 2012) [8].

As is known that the growth of broiler chickens is currently very fast. In the maintenance period of 30-35 days, body weight of 1.5 - 2.0 kg can be achieved per chicken and at this time many farmers started harvesting the chicken. However, the time of harvesters can be adjusted to the time of achievement of chicken body weight favoured by consumers. In certain regions consumers have the desire of broilers with small size (<1 kg per head), on the other hand there are consumers who like large broilers (> 2.0 kg per head). The differences in harvesting time and broiler chicken weight allow differences also in the carcass percentage and the quality of the physical properties of broiler chicken meat. Small broilers (1 -1.5 kg) are mostly in demand by household consumers, while large broilers (> 1.5 kg) are used for house hold processing, such as satay, fried, bake, and traditional dishes like *nasi goreng* (fried rice), *soto* (traditional Indonesian soup), satay, which began to be popularized by the Indonesian Ministry of Tourism; and for the chicken meat processing industry (nuggets, sausages, meat balls). Therefore, it is necessary to evaluate the characteristics of the

broilers physical properties, based on body weight so the consumers can get the necessary broiler carcasses as needed.

Body weights, taken up between four weeks to five weeks of age in broiler chicks, indicated better growth of male birds as compared to females (Sachdev, *et al*., 2011) [9]. The dressed weight, carcass quality traits based on breast, drumstick, taken for birds at four to five weeks of age, were comparatively lower for females than the males, but in this research we didn't considerate of either sexes.

MATERIALS AND METHODS

Materials

25 broilers strain Coobb from Missouri Breeding Farm, Bandung, with body weight between 1.3 kg - 1.7 kg were used. Body weight 1.3 kg, usually reach at 4 weeks old; and the equipment were analytical scales, thermometers, and penetrometers.

Methods

The research was carried out at Food Technology Laboratory, Animal Husbandry Universitas Padjadjaran using 25 broilers and analyzed using Completely Randomized Design with 5 treatments of differences in final body weight of broilers, T-1 (1.3 kg), T-2 (1.4 kg), T-3 (1.5 kg), T-4 (1.6 kg) and T-5 (1.7 kg). The broilers were using Kosher method slaughtering and the treatments were repeated 5 times. The observed variables included the percentage of carcass by comparing carcass weight with live weight, percentage of meat by comparing the meat gain with live weight, tenderness of meat using penetrometer, water holding capacity (WHC) measured using the Filter Pressing Method (Honikel and Hamm, 1994) [3], and cooking losses are measured by comparing the 30 minutes boiled meat at 80-82^{0}C with 30 grams of raw meat.

Statistical Analysis

The study was carried out experimentally, with Completely Randomized Design of unidirectional patterns, five treatments of body weight (1.3 kg, 1.4 kg, 1.5 kg, 1.6 kg and 1.7 kg), and repeated 5 times. To determine the effect of differences in body weight on broiler carcass physical characteristics, the data were analyzed statistically according to the Completely Randomized Design unidirectional patterns five treatments of body weight (1.3 kg, 1.4 kg, 1.5 kg, 1.6 kg and 1.7 kg) with five replications for analysis of variance. If there are significant differences between treatments, Duncan's Multiple Range Test (SPSS-21 software package) is carried out.

RESULTS AND DISCUSSIONS

The average carcass percentage, meat percentage, tenderness, water holding capacity (WHC) and cooking losses of broiler studied, were presented in Table 1 until Table 5.

The broiler carcasses percentage

In Table 1 it can be seen the results for carcass percentage.

Table 1. The Averages data of Carcass Percentage

Observations	Body weight (Kg/bird)				
	1.3	1.4	1.5	1.6	1.7
1	67.6	70.1	70.8	71.2	70.2
2	69.2	70.6	70.0	71.5	72.3
3	70.0	72.4	72.1	72.0	72.9
4	67.2	69.9	70.0	70.0	70.6
5	70.0	70.0	71.1	70.0	71.5
Sum	344.0	353.0	354.0	355.5	357.5
Means	68.8^a	70.6^b	70.8^b	71.1^b	71.5^b

Source: Own results in the laboratory.

The highest average of carcass percentage was shown by 1.7 kg broiler chickens (71.5%), followed by 1.6 kg broilers (71.1%); 1.5 kg (70.8%); 1.4 kg (70.6%) and the lowest are 1.3 kg (68.8%). Even the increase of the body weight does not occur uniformly, but the averages percentage were increase as the body weight increase. According to Radu and Popescu-Miclosanu (2012) [8], the live weight of 50 days broiler, are between 2.554 – 3.047 kg; and the carcass weights are between 1.938 – 2.33 kg (the percentage around 75.88 – 76.46 %); and in this research the carcass percentage are between 68.8% to 71.5%. This result is consistent with the opinion of Bell and Weaver (2002) [1] which states that increasing weekly body weight does not occur uniformly. Every week, the growth of broiler

chickens increases until the maximum weight is obtained, and one that affects the percentage of carcass is live body weight. This result also shows that the percentage of broiler chickens carcasses in each treatment is in the range of 65-75% of live body weight when ready for slaughter (Murtidjo, 1987) [7]. From the results of analysis of variance, it is known that the differences in live body weight in the weight range 1.3 -1.7 kg have significant effect on the percentage of carcass produced.

Meat Percentage

In Table 2, one may see the results for meat percentage.

Table 2. The Averages data of Meat Percentage

Observation	Body weight (Kg/bird) 1.3	1.4	1.5	1.6	1.7
1	51.2	48.8	47.4	46.9	42.3
2	50.0	48.5	47.1	46.8	42.4
3	48.8	48.7	47.5	47.0	42.3
4	50.2	49.0	47.2	46.8	42.5
5	51.3	48.5	46.8	46.5	42.5
Sum	250.5	243.5	236.0	234.0	212.0
Means	50.1[a]	48.7[b]	47.2[c]	46.8[c]	42.4[d]

Source: Own results in the laboratory.

Based on the results of analysis of variance, shows significant differences between treatments (P> 0.05), the percentage of meat in the range of body weight 1.3-1.7 kg resulted the percentage of meat ranging from 42.4 - 50.1 % of life weight. This is due to the age of cutting which is some proportion between meat, bone, and fat and innards are much different.

Meat Tenderness

In Table 3, it can be seen the results for meat tenderness.

Meat tenderness was determined by the amount of pressure needed for each unit area (kg / cm^2) of the product, which can be interpreted as the smaller tenderness obtained, the softer the meat. Meat tenderness is a function of production, value adding, and processing, especially for cooking method used when preparing the meat for consumption. Based on the results of analysis of variance, it did show significant differences between treatments (P> 0.05), this was due to the different age of slaughter in the broiler chickens. The amount and strength of collagen can increase with age, covalent crossing increases as long as the growth and development of livestock and collagen become stronger (Soeparno, 2005) [10]. The suitable cooking method, will reduce the cooking loss and increasing the Water Holding Capacity (Latif, 2010) [5].

Table 3. The Averages of Meat Tenderness

Observation	Body weight (Kg/bird) 1.3	1.4	1.5	1.6	1.7
1	106.6	104.4	99.7	102.7	93.1
2	105.9	104.7	99.1	102.7	92.9
3	106.7	103.9	99.9	97.2	93.0
4	106.4	104.7	100.1	97.0	94.0
5	106.4	105.3	100.0	96.9	93.5
Sum	532.0	523.0	499.0	484.5	466.5
Means	106.4[a]	104.6[a]	99.8[b]	96.9[b]	93.3[c]

Source: Own results in the laboratory.

Water Holding Capacity (WHC)

In Table 4, one may see the results for water holding capacity.

Table 4. The data of Water Holding Capacity

Observation	Body weight (Kg/bird) 1.3	1.4	1.5	1.6	1.7
1	46.0	50.0	53.4	56.4	56.9
2	46.5	50.0	51.9	55.4	57.1
3	46.2	50.0	53.4	55.7	56.5
4	46.3	50.2	53.0	55.0	57.5
5	46.5	50.3	52.8	55.0	56.0
Sum	231.5	250.5	263.5	277.5	284.0
Means	46.3[a]	50.1[b]	52.7[c]	55.5[d]	56.8[e]

Source: Own results in the laboratory.

Water holding capacity, measures the ability of meat to retain its liquid portion during storage, processing and cooking. The major methods used in this treatments is press and cooking methods.

The results of the variance analysis did show a significant difference (P> 0.05) on the Water Holding Capacity (WHC) of each treatment which ranged from 46.3 - 56.8%. This result is slightly greater when compared to the research conducted by Muchbianto (2009) [6], that the range of the value of fresh broiler chicken water binding capacity is 25-38%. According to Soeparno (2005) [10], at the same age, gender has a small effect on

cooking shrinkage, but cutting weight affects cooking losses, especially if there are differences in fat deposits. This water binding capacity is also related to protein because free water molecules amount to about 10% bound between protein molecules will decrease if meat protein denatures. Fat levels are negatively related to protein levels. The higher the level of protein in broiler chicken the higher the binding capacity of water due to the ability of proteins to bind water chemically and increasingly according to fat content.

Cooking losses

In Table 5, one may see the results for cooking losses.

Table 5. The Averages data of Cooking Losses

Obser vation	Body weight (Kg/bird)				
	1.3	1.4	1.5	1.6	1.7
1	23.5	23.9	25.0	27.6	28.5
2	22.7	24.2	25.2	27.6	28.6
3	22.3	23.0	24.8	26.8	28.7
4	22.9	24.4	25.0	28.0	29.0
5	22.1	24.0	25.0	28.0	28.7
Sum	113.5	119.5	125.0	138.0	143.5
Means	22.7[a]	23.9[b]	25.0[c]	27.6[d]	28.7[e]

Source: Own results in the laboratory.

The cooking losses, was used water-bath method, the meat samples are placed in thin-walled plastic bags, where the samples are immersed in continuously boiling water-bath for cooking, with the bag opening extending above the water surface.

The results of analysis of variance showed that the difference in body weight of broiler chicken pieces had significant effect (P> 0.05) on cooking losses. Broiler growing, tend to be followed by increasing of body and abdominal fat. Abdominal fat accumulation in the carcass unfortunately is a problem during processing; because the carcass disposed abdominal fat as by products. The range of cooking losses in this study was 22.7 - 28.7%. Meat that has low cooking losses has good meat quality because of less nutritional. Meat with lower cooking losses has a relatively better quality than meat with a larger cooking losses, because losing nutrients during cooking will be less so that chicken meat with low cooking shrinkage will have better quality compared to chicken with high cooking losses (Soeparno, 2005) [10].

In Table 6, there is the average of carcass percentage, meat percentage, meat tenderness, water holding capacity and cooking losses.

Table 6. The Averages of Carcass Percentage, Meat Percentage, Meat Tenderness, Water Holding Capacity and Cooking Losses

Variables	Body weight (Kg/bird)				
	1.3	1.4	1.5	1.6	1.7
Carcass percentage (%)	68.8	70.6	70.8	71.1	71.5
Meat percentage (%)	0.1	48.7	47.2	46.8	42.4
Meat tenderness (kg/cm^2)	106.4	104.6	99.8	96.9	93.3
Water holding capacity (%)	46.3	50.1	52.7	55.5	56.8
Cooking losses (%)	22.7	23.9	25.0	27.6	28.7

Source: Own results in the laboratory.

CONCLUSIONS

Based on the research that has been done, it can be concluded that the difference in body weight in the range of 1.3-1.7 kg has significantly affected for *(P> 0.05)* the percentage of carcass, percentage of meat, tenderness, water holding capacity, and cooking shrinkage.

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