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Growth and Development of Non-Carcass Organs of Chicken in Different Sex and Age Levels

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Abstract. Chicken is one of the mainstay commodities and is a very popular food ingredient by various groups of society. Chicken consists of carcass and non-carcass parts, all of which are almost utilized. A study conducted on as many as 36 Chickens to see differences in patterns of growth and development of non-carcass organs of different sexes and ages. Data analysis was performed using the allometric equation Huxley $Y = a^X$ The results showed that the coefficient of non-carcass growth and development of non-carcasses of male and female Chickens was significantly different from one which meant that it had time to cook development premature compared to overall body growth and growth patterns of non-carcass organ growth of Chickens both in males and females at the age of 0 - 5 weeks showed no significant difference. It can be said that male and female broiler chickens aged up to 5 weeks have the same pattern of growth and development of non-carcass organs and earlier than the overall body growth.

Keywords: age, chicken, non-carcass organs, sex

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1. Introduction

Broilers make a major contribution to meeting the animal protein needs of the Indonesian people, broilers or broilers have increased. Data shows that every year the population of broilers or broilers has increased. In 2010 Chicken meat production amounted to 1,214,338.96 tons, experiencing growth until 2020 of 3.275,325.72 tons [1]. The average yield of the last 10 years, the population of Chickens every year increases by 96,784.90 tons / year.

Broilers are male or female chickens which are generally harvested at 4-5 weeks with the aim of producing meat [2]. Maintenance of broilers in Indonesia is generally intensive with commercial feed, without differentiating sex. Chicken consists of carcass and non-carcass parts, all of which are almost utilized. There are some things that are not considered by the breeders in maintenance, namely the influence of male and female sexes. This is due to the assumption that gender differences do not have an effect on growth or the products produced. Female broilers produce a

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greater percentage of carcasses with smaller carcass bones and earlier cooked chicken meat has a higher shrinkage than male chickens [3]. The proportion of bone, meat and fat tissue will be influenced by age, nationality, body weight, sex and food [4], [5]. So, to obtain a profitable carcass, the optimal cutting age for Chickens is 4 weeks [6]. The percentage of carcasses is influenced by the age of slaughtering, the longer the slaughtering age, the greater the percentage of carcasses [2].

In this connection the researcher intends to examine more deeply the growth and development of Chickens, particularly regarding the growth and development of non-carcass organs of different sexes and ages.

2. Materials and Methods

The tools and materials used in this study are: cutting blades, scales, stationery, measuring instruments and broilers aged 1, 7, 14, 21, 28 and 35 days for six tails each (3 males and 3 females).

2.1. Research Procedure

In this study Chickens are kept in cage plots with m, width 0.5 m and height 0.5 base litter. Each enclosure is 1 m long. Before maintenance is carried out, the enclosure and equipment are disinfected first using an antisep.

After the DOC arrived, they were given water mixed with sugar to restore the chicken's condition, then the chickens were given stressful vitae, and then randomly placed into the experimental cages, each ten chickens were then given ready feed. And to prevent the occurrence of ND disease vaccination is done using the ND Hitchner B medivac vaccine, through eye drops in chicks. Also given multivitamin "vita chick" and Trymezin to prevent various poultry diseases.

During the research feed and drinking water were given adlibitum. Chicken maintenance is carried out for 35 days. To study the growth and development of non-carcass organs, serial slaughter of chickens was cut at ages 1, 7, 14, 21, 28 and 35 days, so a point plot was obtained to be analyzed for growth and development. Each plot point consists of six heads (male and female) which are slaughtered so that the total number of chickens slaughtered is 36 chickens.

2.2. Slaughtering Process

To determine the carcass and giblet weights, it was done by cutting samples of each experimental 3 animals for each sex at different ages. The chicken cutting procedure is as follows:

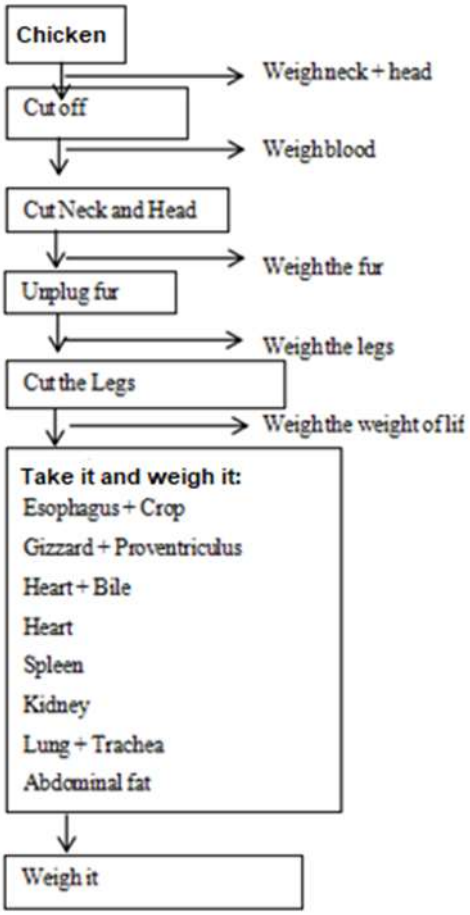

Figure 1. Flow diagram of the chicken cutting process

2.3. Observed Parameters

The parameters of non-carcass organs are:

Tabel 1. Structure of Research Data for Non-Carcass Organ Growth and Growth in Broiler Farms

No	Parameter	1 day	7 day	14 day	21 day	28 day	35 day
		g	g	g	g	g	g
1	Body weight (BW)						
2	Empty BW						
3	Blood						
4	Fur						
5	Head + Neck						
6	Legs						
7	Liver + Bile						
8	Heart						
9	Proventriculus and gizzard						
10	Spleen						
11	Lung + Trachea						
12	Kidney						
13	Abdominal Fat						
14	Esophagus + Crop						

The data obtained is processed using allometric equations Huxley Y = ax, which in its use was first transformed into the logarithmic equation Log Y = Log a + b Log X, where Y = weight of

non-carcass and its components experiencing growth and development and X = Empty body weight/non carcass weight.

Intercept (constant) b The coefficient of relative growth of the analysis results obtained, then tested using the Student's t-test with the formula: thit = -1 sb where: = relative growth coefficient b sb = Standard deviation

2.4. Analysis of Data

Regression analysis is a statistical method used in research. In regression analysis, the relationship between one or more independent variables (independent) X and a response variable (dependent) Y is examined. A simple linear regression model is used. namely:

$$Y_i = a + bX_i + \varepsilon_i,\ i = 1, 2, \ldots, n \quad (1)$$

3. Results and Discussion

3.1. Growth of Blood, Feather, Head, Neck and Feet

Logarithmic data for growth of blood, feather, head and neck and feet at the age of 0-5 weeks are presented in the following Table 2. Based on Table 2, it was showed that the coefficient of growth and development (relative growth coefficient) of the blood part of Chickens is markedly smaller than one (b < 1) of females. This shows that there is no significant difference between males and females at the age of 0 - 5 weeks in terms of growth patterns of all parts of the bloodiest that is early cooking. The percentage of the total in the edible portion (blood, reed, head + neck and legs) of male chickens was 30.16% and female chickens amounted to 31.46%. The research, male chickens with an 8-week cut of the percentage of the total in the edible portion of 28.80% compared to the statement, Jimmy's Farm's local chicken has the percentage of the total in the edible portion (blood, reed, head + neck and legs) that greater than. Increased ration consumption affects high final body weight and results in high edible and inedible weights, thus the final body weight with edible and in the edible weights is positively correlated [7]. That is, the higher the final body weight produced, then followed by edible and inedible weights ((blood, reed, head + neck and legs) as well [8].

Based on Table 2, it was showed that the coefficient of growth and development (relative growth coefficient) of the Chicken feathers is significantly smaller than one (b < 1) of 0-5 weeks of age in both male and female Chicken. This shows that there is no significant difference between males and females at the age of 0.5 weeks in terms of growth patterns of all parts of the feather that is early cooking.

Based on Table 2 it was showed that appears that the coefficient of growth and development (relative growth coefficient) of the head + neck of Chickens is markedly smaller than one (b < 1) of male and female. This shows that there is no significant difference between males and females

at the age of 0 - 5 weeks in terms of growth patterns of all parts of the head + neck that is early cooking.

Based on Table 2 it was showed that can be seen that the coefficient of growth and development (relative growth coefficient) of the Chicken feet is significantly smaller than one (b < 1) of 0-5 weeks of age in both male and female Chicken. This shows that there is no significant difference between males and females at 0-5 weeks of age in terms of growth patterns of all parts of the feet, which are early in nature.

Tabel 2. Growth Coefficient of Broiler Chicken Blood, Feather, Head and Neck and Feet at Different Age Levels

Log Y	Sex	Age (week)	Growth Coefficient		Value	Value
			b	sb	b	r
Blood	Male	0	0.2011	0.0933	b < 1	0.9071
		1	0.3724	0.0102	b < 1	0.9996
		2	0.4688	0.0150	b < 1	0.9995
		3	0.5492	0.0143	b < 1	0.9996
		4	0.5700	0.0199	b < 1	0.9993
		5	0.5567	0.0181	b < 1	0.9994
	Female	0	0.1907	0.0470	b < 1	0.9709
		1	0.3589	0.0167	b < 1	0.9989
		2	0.4379	0.0254	b < 1	0.9983
		3	0.5158	0.0107	b < 1	0.9998
		4	0.5513	0.0091	b < 1	0.9999
		5	0.5450	0.0144	b < 1	0.9996
Feather	Male	0	0.1209	0.0191	b < 1	0.9878
		1	0.3011	0.0333	b < 1	0.9939
		2	0.4712	0.0077	b < 1	0.9998
		3	0.5430	0.0227	b < 1	0.9991
		4	0.5531	0.0134	b < 1	0.9997
		5	0.5857	0.0054	b < 1	0.9999
	Female	0	0.1516	0.0403	b < 1	0.9664
		1	0.2778	0.0569	b < 1	0.9796
		2	0.4616	0.0247	b < 1	0.9986
		3	0.5316	0.0149	b < 1	0.9996
		4	0.5873	0.0101	b < 1	0.9998
		5	0.6009	0.0288	b < 1	0.9988
Head and neck	Male	0	0.5846	0.0096	b < 1	0.9999
		1	0.6229	0.0043	b < 1	0.9999
		2	0.6334	0.0065	b < 1	0.9999
		3	0.6518	0.0063	b < 1	0.9999
		4	0.6597	0.0081	b < 1	0.9897
		5	0.6701	0.0003	b < 1	1.000
	Female	0	0.5843	0.0018	b < 1	0.9999
		1	0.6135	0.0039	b < 1	0.9999
		2	0.6227	0.0118	b < 1	0.9998
		3	0.6410	0.0099	b < 1	0.9998
		4	0.6608	0.0068	b < 1	0.9999
		5	0.6704	0.0142	b < 1	0.9997
Feet	Male	0	0.2242	0.0061	b < 1	0.9997
		1	0.4062	0.0016	b < 1	0.9999
		2	0.5035	0.0047	b < 1	0.9999
		3	0.5373	0.0098	b < 1	0.9998
		4	0.5811	0.0096	b < 1	0.9998
		5	0.5894	0.0099	b < 1	0.9998
	Female	0	0.2603	0.0108	b < 1	0.9991
		1	0.3900	0.0110	b < 1	0.9996
		2	0.4918	0.0163	b < 1	0.9995
		3	0.5162	0.0029	b < 1	0.9999
		4	0.5559	0.0049	b < 1	0.9999
		5	0.5665	0.0063	b < 1	0.9999

3.2. Growth Esophagus and Crop, Gizzard and Proventriculus and Abdominal Fat

Logarithmic data on growths of esophagus and crop, gizzard and proventriculus and abdominal fat are presented in the following Table 3.

Table 3. Growth Coefficient of Esophagus and Crop, Gizzard and Proventriculus and Abdominal Fat of Chicken at Different Age Levels

Log Y	Sex	Age (week)	Growth Coefficient		Value	Value
			b	sb	b	r
Crop's and Esophagus	Male	0	0.00001	0.0012	b < 1	0.0011
		1	0.1489	0.0216	b < 1	0.9896
		2	0.2201	0.0658	b < 1	0.9581
		3	0.2716	0.0164	b < 1	0.9981
		4	0.3041	0.0161	b < 1	0.9985
		5	0.3045	0.0159	b < 1	0.9986
	Female	0	-0.0689	0.0522	b < 1	-0.7972
		1	0.0916	0.0245	b < 1	0.9660
		2	0.1548	0.0159	b < 1	0.9947
		3	0.2612	0.0371	b < 1	0.9900
		4	0.2586	0.0341	b < 1	0.9914
		5	0.2916	0.0261	b < 1	0.9960
Gist and Proventriculus	Male	0	0.3172	0.0162	b < 1	0.9987
		1	0.4129	0.0054	b < 1	0.9999
		2	0.4220	0.0087	b < 1	0.9997
		3	0.4483	0.0044	b < 1	0.9999
		4	0.4585	0.0043	b < 1	0.9996
		5	0.4691	0.0138	b < 1	0.9995
	Female	0	0.0723	0.2678	b < 1	0.2606
		1	0.3774	0.0179	b < 1	0.9988
		2	0.4144	0.0111	b < 1	0.9996
		3	0.4172	0.0199	b < 1	0.9988
		4	0.4534	0.0120	b < 1	0.9996
		5	0.4708	0.0012	b < 1	1.000
Abdominal fat	Male	0	0.0863	0.0809	b < 1	0.7297
		1	0.0813	0.0341	b < 1	0.9220
		2	0.3299	0.0428	b < 1	0.9917
		3	0.4109	0.0154	b < 1	0.9993
		4	0.4902	0.0112	b < 1	0.9997
		5	0.5100	0.0224	b < 1	0.9990
	Female	0	0.1897	0.0175	b < 1	0.9958
		1	0.0450	0.0067	b < 1	0.9885
		2	0.2416	0.0178	b < 1	0.9973
		3	0.3799	0.0321	b < 1	0.9964
		4	0.4635	0.0073	b < 1	0.9998
		5	0.5216	0.0047	b < 1	0.9996

Based on Table 3, it was showed that the growth coefficient (relative growth coefficient) of the esophagus + crop of Chickens is 0-5 weeks in both male and female Chicken. This shows that there is no significant difference smaller than one (b < 1) from the age of 0 - 5 weeks in both males and females. This shows that there is no significant difference between males and females at 0-5 weeks of age in terms of growth patterns of all parts of the esophagus + crop that is early cooking. This is consistent with the opinion which states that the proportion of bone, meat and fat tissue will be influenced by age, breed, body weight, sex and food [4], [5].

Based on Table 3 it was showed that the coefficient of growth and development (Relatite growth coefficient) of the gizzard + proventriculus of Chickens is markedly smaller than one (b < 1) of age 0-5 weeks in both male and female Chicken. This shows that there is no significant difference between males and females at 0-5 weeks of age in terms of growth patterns of all parts of the gizzard + proventriculus which is early cooking

Based on Table 3 it was showed that the coefficient of growth and development (relative growth coefficient) of the Abdominal Fat section of Chickens is markedly smaller than one (b < 1) of both male and female Chicken. This shows that there is no significant difference between males and females at the age of 0 - 5 weeks in terms of growth patterns of all parts of Abdominal Fat that is early cooking. From the results of the data obtained it can be seen that significantly the carcass weight increases with age. This is consistent with the opinion which states that the proportion of bone, meat and fat tissue will be influenced by age, nationality, body weight, sex and food [4], [5].

3.3. Pulmonary Growth Lung and Trachea, Liver and Bile, Heart, Kidney and Spleen

Logarithmic data on lung growth + trachea, liver, heart, kidney and spleen are presented in the following Table 4. Based on Table 4, it was showed that the coefficient of growth and development (relative growth coefficient) of the lung + trachea of Chickens is markedly smaller than one (b < 1) of males and females. This shows that there is no significant difference between males and females at 0 5 weeks of age in terms of growth patterns of all parts of the lung + trachea ie early cooking.

Based on Table 4, it was showed that the coefficient of growth and development (the relative growth coefficient of the liver + bile of Chickens is markedly smaller than one (b < 1) of males and females. This shows that there is no real difference between males and females at the age of 0 weeks in terms of growth patterns of all parts of the liver + bile that is early cooking.

Based on Table 4, it was showed that the growth coefficient (relative growth coefficient) of the heart part of Chickens is significantly smaller than one (b < 1) than both the female. This shows

that there is no significant difference between males and females at the age of 0- 5 weeks in terms of the growth patterns of all parts of the heart in early ripening.

Table 4. Growth Coefficient of Lung + Trachea, Liver and Bile, Heart, Kidney and Spleen Broiler Chicken at Different Age Levels

Log Y	Sex	Age (week)	Growth Coefficient		Value	Value
			b	sb	b	r
Lung and Trachea	Male	0	-0.1939	0.0014	b < 1	-10.000
		1	0.1031	0.0040	b < 1	0.9991
		2	0.2580	0.0433	b < 1	0.9862
		3	0.2964	0.0093	b < 1	0.9995
		4	0.3337	0.0109	b < 1	0.9994
		5	0.3138	0.0128	b < 1	0.9991
	Female	0	-0.1627	0.0186	b < 1	-0.9935
		1	0.0823	0.0254	b < 1	0.9555
		2	0.2232	0.0071	b < 1	0.9955
		3	0.2365	0.0162	b < 1	0.9976
		4	0.2953	0.0092	b < 1	0.9995
		5	0.3242	0.0017	b < 1	0.9999
Liver and Bile	Male	0	0.0473	0.0658	b < 1	0.5859
		1	0.3884	0.0125	b < 1	0.9994
		2	0.4447	0.0126	b < 1	0.9996
		3	0.4789	0.0064	b < 1	0.9999
		4	0.5095	0.0084	b < 1	0.9998
		5	0.5164	0.0250	b < 1	0.9998
	Female	0	0.1265	0.0198	b < 1	0.9878
		1	0.3445	0.0246	b < 1	0.9975
		2	0.4091	0.0105	b < 1	0.9996
		3	0.4512	0.0114	b < 1	0.9996
		4	0.4683	0.0014	b < 1	10.000
		5	0.4748	0.0268	b < 1	0.9984
Heart	Male	0	-0.2938	0.0198	b < 1	-0.9977
		1	0.0619	0.0088	b < 1	0.9908
		2	0.1736	0.0139	b < 1	0.9968
		3	0.2894	0.0067	b < 1	0.9997
		4	0.3099	0.0147	b < 1	0.9988
		5	0.3050	0.0169	b < 1	0.9984
	Female	0	-0.3126	0.0212	b < 1	0.9976
		1	0.0224	0.0101	b < 1	0.9991
		2	0.1705	0.0291	b < 1	0.9857
		3	0.2001	0.0109	b < 1	0.4966
		4	0.2625	0.0072	b < 1	0.9996
		5	0.3106	0.0106	b < 1	0.9994
Kidney	Male	0	-0.3662	0.0064	b < 1	-0.9998
		1	0.0592	0.0198	b < 1	0.9483
		2	0.2383	0.0104	b < 1	0.9990
		3	0.3176	0.0184	b < 1	0.9983
		4	0.3566	0.0077	b < 1	0.9997
		5	0.3289	0.0109	b < 1	0.9994

Table 4. Continued

Log Y	Sex	Age (week)	Growth Coefficient		Value	Value
			b	sb	b	r
Kidney	Female	0	-0.3697	0.0515	b < 1	-0.9904
		1	0.0138	0.0262	b < 1	0.4644
		2	0.2001	0.0249	b < 1	0.9923
		3	0.2840	0.0067	b < 1	0.9997
		4	0.3157	0.0103	b < 1	0.9944
		5	0.3388	0.0083	b < 1	0.9997
Spleen	Male	0	-0.6379	0.0071	b < 1	-0.9999
		1	-0.3896	0.0276	b < 1	-0.9975
		2	-0.2619	0.0112	b < 1	-0.9990
		3	0.0024	0.0347	b < 1	0.0691
		4	0.1249	0.0739	b < 1	0.8607
		5	0.0886	0.0161	b < 1	0.9838
	Female	0	-0.8242	0.1656	b < 1	-10.000
		1	-0.5832	0.1044	b < 1	-.0.9843
		2	-0.1672	0.0480	b < 1	-0.9610
		3	-0.0117	0.0669	b < 1	-0.1029
		4	0.0452	0.0146	b < 1	0.9519
		5	0.0704	0.0170	b < 1	0.9721

Based on Table 4, it was showed that the coefficient of growth and development (relative growth coefficient) of the kidney part of Chickens is markedly smaller than one (b < 1) of females. This shows that there is no significant difference between males and females at the age of 0.5 weeks in terms of growth patterns of all parts of the kidneys which are early in nature.

Based on Table 4, it was showed that the coefficient of growth and development (relative growth coefficient) of the spleen Chickens is markedly smaller than one (b <) from 0-5 weeks of age in both males and female Chickens. This shows that there is no significant difference between males and females at the age of 0 - 5 weeks in terms of growth patterns of all parts of the spleen ie early cooking.

Stated that if b < l means the body component represented by the Y component in this case the non-carcass organ grows slower than the component X in this case body weight [4]. This is in line with statement that: the effect of nutrition has a declining or inversely influence on non-carcass organs on body weight in young Chicken, where Chickens raised in this study are classified as young Chicken until the time of harvest [9]. The results of this study are consistent with the results study which reported that the growth and growth coefficient of all non-carcasses of Chickens was markedly smaller than one (b < 1) both at 2-5 weeks of age [10].

This shows that at the age range of 0 - 5 weeks the growth patterns of all non-carcass organs are premature or develop faster than the overall development of carcass organs. This is in accordance

with the statement , that non-carcass organs have the nature of faster growth because they are vital organs that function to support the early functions of livestock life [11] - [13]. Vital organs in question are the liver, heart, lungs, intestine and stomach, kidneys and spleen and feet.

4. Conclusion

1. The coefficient of growth and development of non-carcass organs of male and female Chickens is significantly different from the one which means that it has an early cooking development time when compared to overall body growth.
2. Patterns of growth and development of non-carcass organs of Chickens both in males and females at the age of 0 - 5 weeks did not show any significant difference.
3. Further research needs to be done on the differences in growth between non-carcass organs in males and females over the age of 5 weeks.

REFERENCES

[1] Statistics of Animal Husbandry and Health, Directorate General of Livestock and Animal Health, Jakarta, 2019.

[2] W. Indra, "Bobot Potong, Karkas, Dan Income Over Feed Cost Ayam Sentul Jantan Pada Berbagai Umur Potong," *Students e-journals*, vol. 4, no. 3, 2015.

[3] Nuraini, A. Napirah, H. Hafid, F. Nasiu, R. Libriani, Y. Yaddi, Elfia, and S. H. Ananda, "Feed consumption, average daily gain and feed conversion of broiler chicken with different feed," *IOP Conf. Series: Earth and Environmental Science*, 465 012047, 2020.

[4] J. Parulian, "Characteristics of carcasses and non-carcasses as well as the physical characteristics of chicken meat of different sex," IPB, Bogor, 2018.

[5] H. Hafid, "Study of growth and distribution of meat and estimation of productivity of fattened cow carcasses," Doctoral Dissertation, IPB Graduate School, Bogor, 2005.

[6] H. Hafid, R.E. Gurnadi, R. Priyanto, and A. Saefuddin, "Identification of carcass characteristics for estimating the composition of beef carcass," *Journal of the Indonesian Tropical Agriculture*, vol. 35, no. 1, pp. 22-26, 2010.

[7] H. Hafid, Rahman, Nuraini, Y. Wati, Inderawati, S. H. Ananda, and L. Ba'a, "Production of broiler chicken carcass fed on rice bran biomass on different marketed ages," IOP Conf. Series: Earth and Environmental Science, 209 012008, 2019.

[8] D. Aldino, "Persentase Edible dan Inedible Karkas Ayam Sentul Jantan Pada Umur Potong Berbeda," Undergraduate Thesis, Universitas Padjajaran, 2016.

[9] Ahmad, B and R. Herman, "Comparison of meat production between roosters kampung and laying hens," *Animal Husbandry Media*, vol. 25, pp. 3-6, 1982.

[10] Soeparno, Science and Meat Technology. Yogyakarta: Gadjah Mada University Pres, 2015.

[11] H. Hafid H, Napirah, and N. Marlina, "The comparison of carcass production of native chicken based of slaughtering age in traditional farming system," Proceedings ADRI International Multidicplinary Conference 12th, pp. 189-191, 2017.

[12] R. Pahlevi, H. Hafid, and A. Indi, "Final weight percentage of carcass and abdominal fat of broiler chickens with betel leaf extract (Piper betle L.) in drinking water," *Journal of Tropical Animal Husbandry Science and Technology*, vol. 2, no. 3, pp. 1-7, 2018.

[13] P. Patriani and H. Hafid, "Percentage of bones, bone, and meat – broiler chicken bone ratio at various weights," Jurnal Galung Tropika, vol. 8, no. 3, pp. 190-196, 2019.