Phenotypic Correlation between Body Weight and Body Part Size of Native Chickens in Moramo District, South Konawe Regency, Indonesia

Muh. Akramullah[1*], Rusli Badaruddin[2], Agus Adrianto[1], Ning Ayu Dwi Tiya[1], Yelsi Lestiana Dewi[1]

[1] *Faculty of Vocational Studies, Defense University of the Republic of Indonesia, Belu.*
[2] *Faculty of Animal Science, Halu Oleo University, Kendari.*
[*]*Corresponding author. Email: muh.akramullah@idu.ac.id*

ABSTRACT

The purpose of this study was to determine the close relationship between body weight and body size of native chicken in Moramo District, South Konawe Regency, Southeast Sulawesi Province, Indonesia. The relationship between body weight and body size is used as a consideration in selecting the body weight of chickens. The research material was 190 native chickens consisting of 95 males and 95 females. The research method is an experiment by weighing body weight and measuring the body parts of chickens using a livestock measuring tape. Parameters observed were body weight, back length, femur length, tibia length, shank length, and chest circumference. Data were analyzed using correlation, determination, and regression analysis. The results showed that the correlation coefficient between body weight and back length, femur length, tibia length, shank length and chest circumference were 0.359; 0.216; 0.234; 0.375; and 0.278 in the rooster, while the female is 0.201; 0.240; 0.281; 0.339; and 0.472. The greatest coefficient of determination was found in the chest circumference of the hen (R=22.29%).

Keywords: Correlation Coefficient, Coefficient of Determination, Native Chicken, Regression Coefficient.

1. INTRODUCTION

Native chicken is a local chicken in Indonesia that has low productivity. Relatively small body size, low body weight, relatively slower growth, and lower egg production than purebred chickens. The advantage of free-range chicken is its resistance to viral and bacterial diseases [1]. Genetic improvement is one solution that can be used. However, it is necessary to have preliminary data on genetic parameters to conduct selection in improving the genetic quality of chickens [2].

The largest poultry kept in South Konawe is native chicken, which is 1,422,704 heads. The population of native chickens is almost evenly spread with the distribution of the number of different populations in each sub-district. Moramo sub-district is an area with a population of 80,800 chickens; this sub-district is the second largest out of twenty-five sub-districts in South Konawe Regency. Moramo District is one of the supply areas for native chicken in Kendari City [3].

Information about the genetics of native chickens, especially in Moramo District, South Konawe Regency, is currently still limited. Genetic information is needed as a reference for improving genetic quality and assisting in the process of preservation and sustainable use. Increasing productivity is not only by improving maintenance management, but it is necessary to improve genetic quality by conducting a breeding program.

The relationship between body weight and body size is an important measurement for predicting body weight and can also be applied quickly in breeding programs [4]. Livestock body weight plays an important role in a good maintenance pattern; alive can influence the selling price of an animal. The heavier the scales, the

higher the selling price, so the skill in estimating the right body weight will be the benchmark for the sale or purchase price. Estimating livestock weight can be measured based on body measurements of livestock and is one of the practical methods of measuring animal body size. Sugeng [5] further stated that body dimensions are a factor that is closely related to the appearance of an animal's body. Body dimensions are often used in conducting seed selection, knowing the nature of offspring, production levels, and estimating body weight.

The purpose of this study was to determine the relationship between body weight and body measurements (body length, femur length, tibia length, shank length, and chest circumference) of native chickens.

2. MATERIALS AND METHODS

2.1. Research sites

This research was conducted from December 2020 to January 2021 in Moramo District, South Konawe Regency, Southeast Sulawesi Province, Indonesia.

2.2. Research Material

The materials used in this study were 190 free-range chickens, each with 95 males and 95 females. The age range of chickens is 6 months to 2 years. The tools used in this research include a measuring tape, scales, calliper, stationery, and camera.

2.3. Determination of Location and Sample

The population used in this study were native chickens in Moramo District, South Konawe Regency. The samples of this study were male and female free-range chickens that had reached maturity and were in the production period with an age range of about 6 months to 2 years which were reared semi-intensively by farmers. The research location was determined by

purposive sampling, namely Moramo District, South Konawe Regency, with the consideration that the research location was one of the districts that had the largest free-range chicken population.

2.4. Data analysis

Data on body weight, body length, femur length, tibia length, shank length, and chest circumference were analyzed using multiple linear regression, correlation, and determination according to the opinion of [6] Stell and Torrie (1993).

The results of the calculation of the correlation coefficient are then interpreted against these values according to the recommendations of [7] as shown in Table 1.

Table 1. Correlation coefficient interval value

Coefficient Value	Relationship Level
0.000 – 0.199	Very low
0.200 – 0.399	Low
0.400 – 0.599	Currently
0.600 – 0.799	Strong
0.800 – 1.000	Very strong

3. RESULTS AND DISCUSSION

3.1. Chicken Body Weight and Body Size

Body weight and body measurements (body weight, body length, femur length, tibia length, shank length, and chest circumference) of native chickens in Moramo District, South Konawe Regency used in this study are presented in Table 2.

Based on the study results in Table 2, it was found that the average body weight and body size in male chickens was greater than that of female chickens. This is influenced by the hormones oestrogen and

Table 2. Body weight and body measurements of native chickens in Moramo District, South Konawe Regency

Variable	Male (n=95)		Female (n=95)	
	Average	KK	Average	KK
Body Weight (g)	1,622.18±330.95	20.40	1,177.35±235.77	20.03
Body Length (cm)	13.06±1.74	13.30	12.09±0.90	7.46
Femur Length (cm)	9.57±1.03	10.76	8.61±1.08	12.55
Tibia Length (cm)	13.75±1.26	9.15	11.90±1.25	10.52
Shank Length (cm)	7.91±1.02	12.91	6.52±0.92	14.16
Chest size (cm)	29.42±4.86	16.53	26.38±2.48	9.39

Description: n= Number of Samples; KK= Coefficient of Diversity

testosterone in chickens. According to Short [8] the hormone oestrogen can inhibit bone growth, so female cattle have a smaller body frame than male cattle, but the hormone oestrogen can stimulate the growth of body fat. Therefore, female cattle will accumulate more fat in their bodies than cattle male. On the other hand, testosterone can stimulate bone growth and suppress the growth of body fat.

The coefficient of diversity in this study was highest in rooster body weight of 20.40% and the lowest was found in hen's back length of 7.46%. Research results from Amlia *et al*. [9] showed that the body weight of male free-range chickens in Lasalimu District, Buton Regency, Indonesia, had a diversity coefficient of 10.70% and females of 7.97%. Tantu [10] mentioned that the average body weight of native chickens kept in Watutela Village, Indonesia, has a coefficient of diversity for males 27.20% and for females 15.39%.

3.2 Correlation Coefficient of Body Weight and Body Size of Native Chicken

The correlation coefficient shows the value of the close relationship between the observed variables of body weight and body sizes of native chickens. The results showed the correlation coefficient between body weight and body sizes of native chickens in Moramo District, South Konawe Regency, presented in Table 3.

The correlation coefficient between body weight and body size of native chickens, in general, has a low and positive relationship, both in males and females, except for body weight and chest circumference (BB - LD) of female chickens with moderate and positive closeness levels. This is in accordance with the opinion of Semakula *et al*. [11] that chest circumference is the best benchmark for determining chicken body weight. A similar result is reported by Lestari [12] that there is a strong and positive correlation between body weight and chicken breast width.

3.3 Regression Coefficient and Determination of Body Weight and Body Size of Native Chicken

Regression is a statistical technique used for numerical analysis between the input variable X and the output variable Y. The value of the coefficient of determination aims to predict how much the influence of the independent variable (X) contributes to the dependent variable (Y) or between body weight variable Y and body size is a variable. X free-range chickens in Moramo District, South Konawe Regency, are presented in Table 4.

Table 4 shows that the coefficient of determination shows that the body weights of both male and female native chickens using five independent variables were observed. Hence, the female chicken breast

Table 3. Correlation of Body Weight and Body Size of Native Chickens in Moramo District, South Konawe Regency

Variable	Correlation (r)	
	Male (n=95)	Female (n=95)
BB − PP	0.359*	0.201*
BB − PF	0.216*	0.240*
BB − PT	0.234*	0.281*
BB − PS	0.375*	0.339*
BB − LD	0.278*	0.472**

Description: r = correlation coefficient; * = low; **= medium; BB= body weight; PP= body length; PF= femur length; PT= tibia length; PS= shank length; LD= chest size

Table 4. Regression Coefficient and Determination of Body Weight and Body Size of Native Chickens in Moramo District, South Konawe Regency

Variable	Male (n=95)		Female (n=95)	
	Regression	Determination	Regression	Determination
BB − PP	BB = 728.6 + 68.40 PP	12.89	BB = 541.9 + 52.54 PP	4.04
BB − PF	BB = 957.8 + 69.45 PF	4.67	BB = 726.1 + 52.39 PF	5.76
BB − PT	BB = 774.5 + 61.67 PT	5.48	BB = 548.4 + 52.86 PT	7.90
BB − PS	BB = 660.7 + 121.5 PS	14.06	BB = 612.2 + 86.64 PS	11.49
BB − LD	BB = 1066 + 18.92 LD	7.73	BB = - 9.0 + 44.97 LD	22.28

Description: BB= body weight; PP= body length; PF= femur length; PT= tibia length; PS= shank length; LD= chest size

circumference was the best predictor. This is because the hen's chest circumference has a higher determination value (R^2) (22.28%). The high percentage of body weight determination with chest circumference is in line with the results of the correlation coefficient analysis, which has a positive and moderate relationship, so that chest circumference is very suitable for estimating body weight or in estimating body weight in female chickens in Moramo District, South Konawe Regency. Confirmed by Olatunji-Akioye and Adeyemo [13], chest circumference has a high level of accuracy so that it can be used to estimate the body weight of livestock.

4. CONCLUSION

The results of this study concluded that the relationship between body weight and body size of native chickens, which included body length, femur length, tibia length, shank length, and chest size, the size of the hen's breast circumference, had a moderate and positive relationship with body weight as shown from correlation coefficient and determination, namely 0.472 and 22.28%.

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