

**STUDY OF BODY DIMENSION OF GAGA' CHICKEN, GERM PLASM OF LOCAL CHICKEN FROM SOUTH SULAWESI-INDONESIA**

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**ABSTRACT:** Gaga' chicken is the local chicken at South Sulawesi that have unique, specific, and different crowing sound with the other types of crowing chicken in the world. This uniqueness of Gaga' chicken was especially at the ending of crowing sound which is like the voice character of human laughing. Unfortunately, the scientific information of the phenotypic description and morphological traits of Gaga' chicken was limited. This study was carried out to determine some body dimensions of Gaga' chicken and to demonstrate the correlations between these body measurements and live weight for providing more accurate data that can be used in breeding and development of Gaga' chicken as one of the ornamental chicken in Indonesia. The body measurement parameters, which were recorded from 57 birds Gaga' chicken, were body weight, shank length, shank circumference, drumstick length, thigh length, keel length, chest girth, breast width, body length, wing length, beak width, and comb height. The measurement were using weight scale, metric line, and caliper. Some body dimensions of Gaga' chicken were similar to Kampong chicken except shank circumference, drumstick length, wing length, and comb height of Gaga' chicken tended to be larger. The correlation coefficient range between body dimensions of Gaga' chicken were low to high (0.171 to 0.710). Highest correlation was shown between body weight and chest girth and that result can be choosed as one of the selection criteria of Gaga' chicken.

**Keywords :** Gaga-chicken, singing chicken, body dimension, germ plasm, correlation

**INTRODUCTION**

The indigenous chickens are repositories of unique genes that could be used in other parts of the world [1]. It is needed for their conservation to keep genetic variation within and between local breeds. According to the United Nations Convention on Biological Diversity, which is ratified in 1992, includes specific references to conserving genetic diversity in domestic livestock, using this diversity in a sustainable manner and sharing the benefits of this use [5]. Indonesia have many genetic diversity in domestic livestock such as Gaga' chicken. Gaga'chicken was one indigenous chicken of crowing type from South Sulawesi Indonesia. This chicken was originated from Sidenreng Rappang (Sidrap) District, South Sulawesi, Indonesia. At Sidrap, Gaga' chicken was called as Manu' Gaga (manu' means chicken and Gaga' means stuttering or stammering). Shape, color, and size of Gaga' chicken were similar to Indonesian local chicken in general but they have unique crowing sound like people laughing.

Long years ago, Gaga' chicken was a social status symbol for royal family at Bugis tribe. This fact made Gaga' chicken were rare because ordinary people were unwilling to adopt Gaga' chicken. However, nowadays, many people in Indonesia love to raise Gaga' chicken and became spread to many places in Indonesia and many uncontrolled mating were done. Therefore some concerns about the purity of Gaga' chicken were needed. Unfortunately, the research of Gaga' chicken was limited and there is no founded scientific information of the phenotypic description, morphological traits, reproduction traits, production traits, and the blood scheme related with an examination of biochemical polymorphisms of the "Gaga-chicken".

Actually, those information on the Gaga' chicken would be useful in optimizing both conservation and utilization strategies for indigenous chicken genetic resources in Indonesia. The 12 breeds of ornamental chicken among 31 breeds of indigenous chicken has already identified [12,14]. Beside that the blood samples of 15 breeds of indigenous chicken of Indonesia has already checked [22]. Unfortunately the information of Gaga' chicken which is superiority of crowing sound has not yet been discovered. Therefore, for basic information, the characterization of phenotypic and morphological information of Gaga' chicken were needed.

Several goals of the FAO's global strategy for conserving animal genetic resources are to identify and understand those unique genetic resources, monitoring particularly those resources which are currently represented by small populations of animals and to communicate to the world community the importance of our domesticated animal genetic resources and the associated diversity, its current exposure to loss and its irreplaceability.

This study was intended to characterize and analyze the morphometric characters based on the size of the body dimension and some correlation among body dimensions for providing more accurate data that can be used in breeding and development policy of Gaga' chicken as one of indigenous and ornamental chicken of Indonesia.

## MATERIALS AND METHODS

The study was conducted at Sidrap District, Wajo District, Barru District, and Parepare South Sulawesi, Indonesia using 57 roasters of Gaga' chicken which were reared at local farmer under the traditional system by sitting on the perch all day. All of the observed chickens have reached matured conditions.

This study was done by a survey method to collect data by random sampling method. Data were analyzed by descriptive statistical analysis. The various body dimension namely body weight, body length (distance from the beginning/or base of the neck to the cloaca), shank length (length of the tarsometatarsus from the hock joint to the metatarsal pad), shank circumference (circumference of the shank), drumstick length, thigh length (the length from the knee joint to the hock), keel length (the length region of the sternum), chest girth (the circumference of the breast around the deepest region of the breast), breast width (the distance between the right and left glenoid cavity), wing length (the linear measurement from the caput humeri to the end of the third carpal digit), beak width (measured from the insertion of the beak in the skull and perpendicular until the end of the inferior mandible), and comb height (distance between the point of attachment of the comb to the head and its highest point (Figure 1). If the number of spikes is even, the highest must be chosen) were measured [4, 19, 25, 26]. All measurements were taken by the same person to avoid between-individual variations. Measurements on body weights and various body dimensions were individually collected from Gaga' chicken using a weighing scale (gr), a measuring tape calibrated in centimeters (cm) and caliper (cm). Means, standard errors and coefficients of variation of body weights and various body measurements were calculated using the SPSS 16 [21]. Correlations (r) among body weights and the various body dimensions were also estimated.

## RESULTS

The means ( $\pm$ SD) and coefficient of variations of body weights and body dimensions of Gaga' chickens in the study area were shown in Table 1. Some body sizes were determined the characteristics of the chicken such as body weight, shank length, drumstick length, thigh length, and comb height [17]. Some body dimensions such as shank circumference, drumstick length, wing length, comb height of Gaga' chicken tend to be longer than Kampong chicken while the thigh length of Kampong chicken tend to be longer [16]. In general, the size of body dimensions of Gaga' chicken were not much different from other type such as Kampong chicken. This performances result means that Gaga' chicken was tended to be similar breed with Kampong chicken however generally body conformation especially breast width were different among breeds of chicken [9]. The average body weight of Gaga' chicken (1,71 kg) was in the range body weight (1,35 – 2,5 kg) of Wareng chicken [7] and 1,73 kg of Kampong chicken [23] but lighter than other Kampong chicken (2,405 kg) [13]. The body weight (1710,3 gr Vs 1370 gr) and the measurement of shank length (10,2 cm Vs 6,65 cm), comb height (4,7 cm Vs 2,17 cm), and chest girth (30,3 cm Vs 27,42) cm of Gaga' chicken tended to be bigger than those of indigenous chicken from Nigeria, respectively [27]. Body weight of Gaga' chicken were lighter than those of Koeyoshi (3,0-4,5 kg) as singing type chicken from Japan.

Shank length of Koeyoshi (11-13 cm) also longer than Gaga' chicken. In other hand, body weight (1,5-1,8 kg) and shank length (8,5-9,5 cm) of Tomaru, other singing type chicken from Japan, was similar with Gaga' chicken [24]. Wing length of Gaga' chicken (24.2 cm) were longer than Kampong chicken of 22.7 cm [15] and 23.4 cm [18]. Gaga' chicken also tended to have longer of thigh than Kampong chicken (11.6 cm Vs 10,2 cm) [18] and keel (17.0 Vs 13.5 cm) [3]. Kampong chicken tended to be longer and wider than Gaga' chicken of drumstick length (15.2 cm Vs 14.4 cm) [18]; shank length (11.0 cm Vs 10.2 cm) and shank circumference (5.3 cm Vs 5.0 cm) [10]. Coefficients of correlation of body weights and body measurements are presented in Table 2. The correlation coefficients ranged from 0,171 to 0,710. Among the body shape characters, the highest correlation was found between body weight and chest girth ( $r = 0,710$ ). Generally high correlation were found between body weight and shank circumference ( $r = 0,634$ ), thigh length ( $r = 0,640$ ), keel length ( $r = 0,640$ ) and brest width ( $r = 0,586$ ); between shank length and drumstick length ( $r = 0,544$ ), wing length ( $r = 0,568$ ); between drumstick length and wing length ( $r = 0,525$ ); between chest girth and breast width ( $r = 0,524$ ), respectively. The estimates of correlation in the present study are lower than those of indigenous chicken at Senegal [6]; than Jinghai Yellow chicken [28]; than indigenous chicken at Nigeria [27].

**Table 1. Average, standard deviation and coefficient of variation of body dimension of Gaga' chicken**

Body dimensions	Mean $\pm$ s.d	CV (%)
Body weight (g)	1710,3 $\pm$ 371,6	4,6
Shank length (cm)	10,2 $\pm$ 1,1	9,1
Shank circumference (cm)	5,0 $\pm$ 0,5	9,2
Drumstick length (cm)	14,4 $\pm$ 1,3	11,3
Thight length (cm)	11,6 $\pm$ 1,3	9,0
Keel length (cm)	17,0 $\pm$ 2,6	6,5
Chest girth (cm)	30,3 $\pm$ 2,9	10,1
Breast width(cm)	14,2 $\pm$ 1,8	8,1
Body length (cm)	21,7 $\pm$ 1,9	11,8
Wing length (cm)	24,2 $\pm$ 2,3	10,5
Beak width (cm)	3,1 $\pm$ 0,6	5,2
Comb height (cm)	4,7 $\pm$ 1,5	3,1

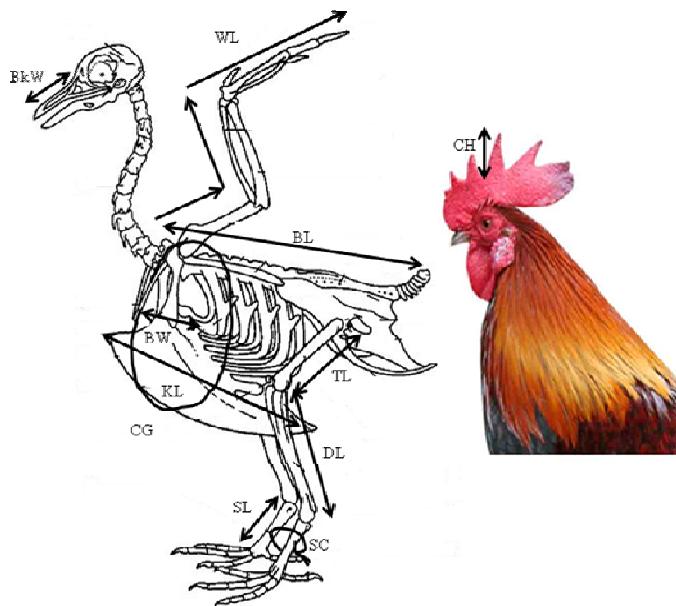
**Table 2. Phenotypic correlations among body dimension of Gaga' chickens**

	A	B	C	D	E	F	G	H	I	J	K
A	1,000										
B	0,369	1,000									
C	0,634	0,283	1,000								
D	0,393	0,544	0,364	1,000							
E	0,640	0,469	0,471	0,277	1,000						
F	0,640	0,473	0,399	0,493	0,416	1,000					
G	0,710	0,277	0,490	0,282	0,478	0,393	1,000				
H	0,586	0,121	0,402	0,171	0,368	0,456	0,524	1,000			
I	0,437	0,236	0,135	0,062	0,385	0,328	0,207	0,161	1,000		
J	0,419	0,568	0,204	0,525	0,284	0,395	0,385	0,098	0,269	1,000	
K	0,271	0,610	0,155	0,383	0,420	0,361	0,255	0,075	0,2467	0,425	1,000

A = body weight; B = shank length; C = shank circumference; D = drumstick length;

E = thight length; F = keel length; G = chest girth; H = breast width; I = body length;

J = wing length; K = beak width



**Figure 1. Body dimension of Gaga' chicken** [http://id.wikipedia.org/wiki/Berkas:Squelette\\_oiseau.svg](http://id.wikipedia.org/wiki/Berkas:Squelette_oiseau.svg)  
**BL** : body length; **SL** : shank length; **SC** : shank circumference; **DL** : drumstick length; **TL** : thigh length;  
**KL** : keel length; **CG** : chest girth; **BW** : breast width;  
**WL** : wing length; **BkW** : beak width; **CW** : comb height

## DISCUSSION

The study of Indonesian local chicken breeds as genetic resources has received very little scientific attention. Identification and characterization efforts of local ornamental chicken is still very necessary. Descriptive phenotypic identification of Gaga' chickens is needed to determine the performance characteristics, morphology and purity of a nation of chicken that can be distinguished visually from other ornamental chickens. The diversity of animal body size caused by genetic and environmental factors [17]. One way to identify the genetic diversity of local ornamental chicken is measure on both qualitative phenotype characteristics (such as comb height) and quantitatively (such as some body dimensions).

Body dimension measurements have been found useful in contrasting size and shape of animals [2] beside that it can also be used to determine the morphogenetic from certain types of livestock widespread in the population between regions or countries. Information on the structure of body morphometrics and its various parameters in chickens and other birds are essential for an understanding of selection for phenotypic variability [20]. Body shape of Indonesian local chicken's was affected by comb height, wing length, femur length, and drumstick length [16]. Beside that drumstick length also highly influence the body size of a chicken. The length of thigh, drumstick length, and also the comparison between shank length and shank circumference showed the effective value in the estimation of body conformation. Shank length was also one of quantitative trait of growth parameter [10].

Body weight and body morphometrics in chickens have been used to establish phenotypic correlations among various genetic groups [27]. Drumstick length, wing length and comb height were known as some important quantitative traits [8]. The shape of the body is affected by the comb height, wing length, thigh length, and drumstick length [16]. The crowd of Pelung chicken were overlapping with those of Gaga' chicken and the body conformation of Gaga' chicken was similar with those of Pelung chicken [3]. Those are indicated that Gaga' chicken could be selected as similar type of singing type with Pelung chicken.

The range of coefficient of variation of 5-15% shown high homogeneity or low heterogeneity [11]. Generally, the homogeneity of Gaga' chicken population were high ( $CV = 3,1-11,8\%$ ) and it is not recommended to do the selection activity in that population. However, the information of comparison of body dimension with other local chicken in Indonesia was very limited.

## CONCLUSION

Several body dimension of Gaga' chicken were similar with body dimension of Kampong chicken. Homogeneity of body dimension of Gaga' chicken still high. The correlation between body weight and chest girth was high ( $r = 0,7$ ) and could be suggested to one of criterion selection of Gaga' chicken.

The strong relationship existing between body weight and body measurements may be useful as selection criterion, since positive correlations of traits suggest that the traits are under the same gene action (Pleiotropy). This, therefore, provides a basis for the improvement of the native stock.

## ACKNOWLEDGMENT

For procurements of "the Gaga-Chicken" as rare domestic poultry breed in Indonesia, we gratefully acknowledge the help and kindness of the Hasanuddin University Indonesia and Directorate of Higher Education of Indonesia (Proyek Peningkatan Penelitian Pendidikan Tinggi Dirjen DIKTI) for providing the laboratory enhancing fund 2013. The authors wish to thank to Hasanuddin University Indonesia and University of Miyazaki Japan for providing the enhancing cooperation of joint research and publication chances. Similarly acknowledged are the help and kindness of Associate of Ayam Ketawa Sidrap District South Sulawesi with all the farmers. For scientific helping hands, we were grateful to the "PKM 2013-Alukaga team" of Hasanuddin University (Trianta Tahir, Fachri Ashari, Achmad Mislah, Rasmi).

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