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Short Communication: Variation in vocal cord morphometric characters among dangdut type and the slow type Gaga Chicken

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Abstract. *Abinawanto, Sophian A, Effendi PS, Siswantining T. 2018. Short Communication: Variation in vocal cord morphometric characters among dangdut type and the slow type Gaga Chicken. Biodiversitas 19: 1902-1905.* Gaga chicken is one of the ornamental chicken originating from Sidendreng and Rapang (South Sulawesi). Gaga chicken has a unique crowing sound, like people laugh. Gaga's chicken which has a long and fast crowing sound known as the dangdut type, while those with short and slow crowing sound are known as slow type. Study was conducted in Pinrang (South Sulawesi), where one of the pure strains are located. Samples were collected from Kanie, Bullo, Macege, Rappang, and Sidenreng. The purpose of study was to determine the characteristics of the vocal cord morphometric among the dangdut type and the slow type of Gaga's chicken. All of the morphometric data were recorded and analyzed by Mean Test, using SPSS (version 22). The results showed that there was no significant difference ($\alpha = 0.010$) among the dangdut type and the slow type based on syrinx morphometric. Meanwhile, according to the trachea muscle morphometric the results showed that the trachea muscle of dangdut type was longer than the slow type ($\alpha < 0.010$). In addition, either the right or the left trachea muscle of dangdut type was longer than either the right or the left trachea muscle of the slow type ($\alpha < 0.010$).

Keywords: Gaga chicken, morphometric, vocal cord, dangdut type, slow type

INTRODUCTION

Gaga chicken comes from an area in South Sulawesi named Sidrap (Prawira 2014). At a place in Sidrap called Baranti, chicken laughed or better known to the people by the name of manu "Gaga", has been maintained from generation to generation (Andrianto et al. 2015). Because of its melodious voice, gaga chickens is often made a contest (Robin et al. 2015). Gaga chicken that often wins the contest has a price reaching hundreds of millions of million rupiahs (IDR) so that this chicken has the potential to be developed as a chicken with a good economic value (Prawira 2014; Andrianto et al. 2015; Robin et al. 2015).

Based on the type of crowing sound, gaga chicken is classified into two types, i.e., the slow type and dangdut type (Junaedi 2012). The grouping of type of crowing sound of gaga chicken into dangdut and slow types was based on agreement on the chickens laughing (KOMPAK) (Abinawanto and Efendi 2017). When viewed from the color of the feathers, gaga chicken can be categorized into several types, namely: korro (black base color with golden yellow back), ceppaga (white color scattered on the chest to chicken stomach), lappung (red dominated color yellowish on his body) and bakka (white dominance on all parts of his body) (Roiz 2011; Bahmid 2015).

Chicken diversity can be identified based on several analysis, one of which is morphometric analysis (Abinawanto and Efendi 2017). Morphometric is an identification technique carried out by observing the physical characters (Rusfidra 2004). Campbell and Lack (1985) stated that morphometric consists of two large components, namely the size and the shape. According to Ishii et al. (1996), body size and shape can be used to distinguish a series within a population. The quantitative nature of morphometrics also plays an important role in mapping the productive traits in the utilization of a species; these quantitative properties are influenced by genetic factors (genetic), environmental and genetic and environmental interactions (Campbell and Lasley 1985). According to Miller et al. (2007), study of chicken sound variation can be done by morphometric analysis on vocal cord organ. In a study by Eliyani et al. (2015) revealed that the shape and size of producing organs between roosters and hens were different. The sound in chickens is produced by the organs at the end of the tracheal tract, syrinx (Setijanto 1998). Sound variations in the singer's cock are affected by vocal cord organ including trachea, trachea and syrinx muscles (McLelland 1990; Setijanto (1998). Mutations in sound-producing organs including trachea, tracheal and syrinx muscles cause a certain variation in species Chicken Ketawa (Prawira 2014).

The use of morphometric method to measure chicken kinship has so far been done on Bangkok chicken, Katai chicken (Sitanggang et al. 2016), chicken (Kurnia 2011; Mariandayani et al. 2013; Sitanggang et al. 2016), Chicken Sentul, Chicken Kedu (Kurnia 2011) and Chicken Broiler (Mariandayani et al. 2013) by using body weight analysis,

femur length, tibia length, shank length, shank circumference, third finger length, wing length, maxilla length, jengger, long bone neck, chest length and chest width.

Our previous studied shown the relationship between some characters of body morphometrics characteristics and biodiversities of gaga chicken, particularly slow type and dangdut type. However, the role of vocal cord morphometrics on song expression of gaga chicken, such as slow type and dangdut type has not been studied, yet. Therefore, this research was conducted.

MATERIALS AND METHODS

Study area

The study was conducted in January 2018-July 2018 in Pinrang District, Province of South Sulawesi, Indonesia in chicken farms in 5 Subdistricts (Malimpung, Tiroan, Mattiro Bulu, Lamrisang, and Sawito/Wattang Sawito). Geographically, Pinrang is located at 3º19'13 "to 4º10'30" South Latitude and 119º26'30 "to 119º47'20" East Longitude. The area is located at an altitude of 0-2600 meters above sea level. The research area is approximately ± 1,961.77 km^2, consisting of three regional dimensions covering lowland, sea, and highland. Pinrang district, administratively, consists of 12 sub-districts, 40 urban-village, and 67 villages covering 96 neighborhoods and 181 hamlets. The total subdistricts in coastal areas have 1,457.19 km^2 or 74.27% of the total area of Pinrang District with a total coastline length of ± 101 km (Center for Statistical Bureau of Pinrang District 2018).

Procedures

Twenty Gaga chicken (10 dangdut type and 10 slow type) was collected from several farms in Pinrang, South Sulawesi, Indonesia. Pinrang consists of the village of Malimpung, Tiroan, Mattiro Bulu, Lamrisang, and Sawito (Wattang Sawito) (Figure 1). The morphometric characters measured were the trachea, right tracheal muscle, left tracheal muscle and syrinx (Figure 2). Morphometric characters were measured using a sliding range.

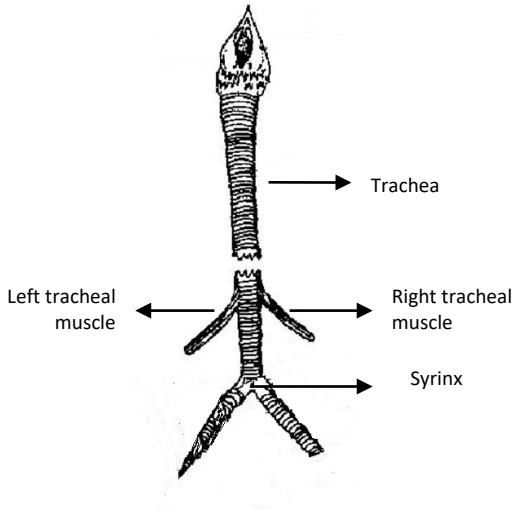

Figure 2. Vocal cord organ of gaga chicken

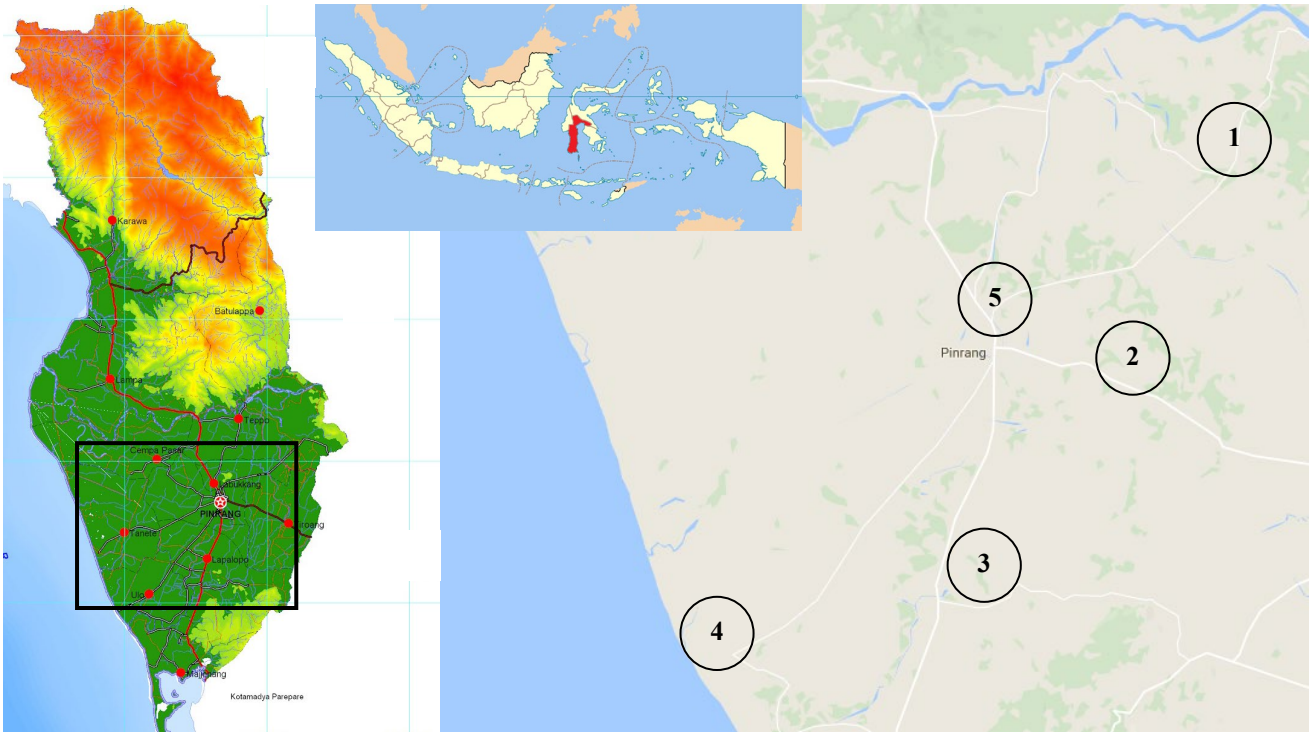

Figure 1. Sampling site in five subdistricts from Pinrang, South Sulawesi, Indonesia. A. Malimpung, B. Tiroan, C. Mattiro Bulu, D. Lamrisang, and E. Sawito (Wattang Sawito)

Data analysis

Discriminant analysis was used to determine the significant differences between groups based on the observed morphometric characters. The results were further analysis and descriptively discussed. The variables used consisted of dependent variable (gaga chicken type) and independent variable (length of trachea, right tracheal muscle length, left tracheal muscle length and syrinx length).

RESULTS AND DISCUSSION

Mean of morphometric gaga chicken vocal cord

The average length of dangdut type chicken trachea was 104.04 mm while that of the slow type chicken was 89.55 mm. The average length of the right tracheal muscle of the dangdut type was 13.52 mm and that of slow type gaga chicken was 11.00 mm. Dangdut type had an average length of left tracheal of 11.94 mm while the slow type gaga chicken had a mean left trachea muscle of 10.34 mm. The average length of syrinx of dangdut type was 14.73 mm while that of the slow type was 13.58 mm (Table 1 and Figure 3). Test of Mean differences between dangdut and slow types in each independent is presented in Table 2.

The significance value (α) specified was 0.01. Based on Table of Tests of Equality of Group Means, the value of Sig. for syrinx variable was 0.016> 0.010, suggesting that, the length of syrinx cannot explain the different types of gaga chickens. Syrinx, in some birds there are muscles attached directly to the syrinx to regulate the syrinx voltage. The amount of syrinx muscle affects the sound produced (McLelland 1990; Setijanto 1998). However, according to McLelland (1990), internal muscle syrinx in chickens does not exist. This is in line with Sudjana (2017), who which stated that Syrinx is part of respiratory tract which capable of producing sounds. However, the high low sound variations in chickens are not determined by syrinx. Syrinx is a ballot box in poultry. The sound of the chicken is generated from the air pressure on the sound valve and is modified by muscle tension (McLelland 1990). Syrinx consists of ossified cartilage, membranes, and muscles (Myers 1917). Chicken Syrinx is located behind the heart organ (Onuk et al. 2010). According to Eliyani et al. (2015), syrinx morphometric can be used to differentiate variations in the frequency of resonant sound between chickens and females.

As for tracheal variables, the sig values of right tracheal muscle and left tracheal muscle, were less than 0.010, meaning that these variables can explain the different types of chickens. This finding is in accordance with McLelland (1990) and Setijanto (1998), who stated that the sound setting in chickens is affected by the trachea and the tracheal muscles, the sternotrachealis musculus. The sternotracheal muscle consists of a pair of membranes that are attached to the craniolateral of sternum process and extend to the trachea to the cranial part of the syrinx (McLelland 1990). Both tracheal muscles appear smaller in the hens than in the rooster (Myers 1917).

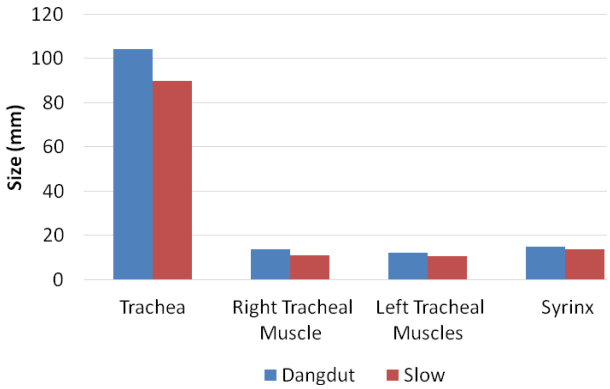

Figure 3. The average size of the vocal cords organ

Table 1. Means of morphometric data of chicken vocal cord

Gaga chicken type	Vocal cord			
	Trachea (mm)	Right tracheal muscle (mm)	Left tracheal muscle (mm)	Syrinx (mm)
Dangdut	104.04	13.52	11.94	14.73
Slow	89.55	11.00	10.34	13.58

Table 2. Test of mean difference between groups of dangdut and slow gaga chicken

Vocal cord	Wilks' Lambda	F	df1	df2	Sig
Trachea	0.321	38.110	1	18	0.000
Right tracheal muscle	0.505	17.624	1	18	0.001
Left tracheal muscle	0.644	9.929	1	18	0.006
Syrinx	0.717	7.116	1	18	0.016

The cocking sound in chickens occurs when the air in the lungs passes through the tympanic membrane of the internal form and the external tympanic membrane associated with the lateral bronchial wall. Sound variation is generally caused by differences in the poultry ballot contained in the trachea and the lower trachea, lying between the branched trachea and the two bronchi (Tanudimadja 1974). The vocalizations depend on proper syrinx and airflow configurations. Musculus tracheolateralis, musculus sternotrachealis, syrinx structures, clavicular air sacs, and ventilator muscles will work together to form a sound system (Gaunt and Gaunt 1977).

In conclusion, the result of morphometric analysis of the vocal cords can be used as one of the methods to reveal the relationship between gaga chicken dangdut and slow type. Variables that can be used to distinguish the type of gaga chicken, i.e., the dangdut and the slow type, were the length of trachea, right tracheal muscle length, and the length of the left tracheal muscle.

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