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IDENTIFICATION OF PHENOTYPIC VARIATION OF KAMPUNG CHICKEN IN KALEMAGO VILLAGE, EAST LORE DISTRICT, POSO REGENCY

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Abstract
Kampung chickens are one of Indonesia's most widely raised poultry types and have high genotype and phenotype variations. This study aimed to identify phenotypic variations in quantitative and qualitative traits of Kampung chickens in Kalemago Village, East Lore District, Poso Regency, Central Sulawesi. Quantitative traits observed include body weight, back length, chest circumference, length of the upper thigh bone, lower thigh bone, and shank. The qualitative characteristics observed include feather colour, comb type, beak colour, and shank colour. Measurements were conducted on male and female populations of Kampung chickens. The study results revealed significant diversity in the quantitative and qualitative traits of Kampung chickens in Kalemago Village, providing a basis for breeding programs aimed at increasing Kampung chicken productivity.
Keywords: Kampung chickens, morphometry, qualitative traits, quantitative traits

IDENTIFIKASI VARIASI FENOTIPIK AYAM KAMPUNG DI DESA KALEMAGO, KECAMATAN LORE TIMUR, KABUPATEN POSO

Abstrak
Ayam kampung merupakan salah satu jenis unggas yang paling banyak dipelihara di Indonesia dan memiliki variasi genotip serta fenotip yang tinggi. Penelitian ini bertujuan untuk mengidentifikasi variasi sifat kualitatif dan kuantitatif ayam kampung di Desa Kalemago, Kecamatan Lore Timur, Kabupaten Poso, Sulawesi Tengah. Sifat kuantitatif yang diamati meliputi bobot badan, panjang punggung, lingkar dada, panjang tulang paha atas, tulang paha bawah, dan shank, sementara sifat kualitatif meliputi warna bulu, jenis jengger, warna paruh, dan warna shank. Pengukuran dilakukan pada populasi ayam kampung jantan dan betina. Hasil penelitian menunjukkan adanya keragaman yang signifikan dalam sifat kuantitatif dan kualitatif ayam kampung di Desa Kalemago, yang dapat dijadikan dasar dalam program pemuliaan untuk meningkatkan produktivitas ayam kampung. Penelitian ini memberikan informasi penting bagi pelestarian sumber daya genetik ayam kampung lokal dan pengembangannya.
Kata kunci: Ayam kampung, morfometri, sifat kualitatif, sifat kuantitatif

INTRODUCTION

Kampung chickens are among Indonesia's most widely spread poultry (Alfian et al., 2017). They are defined as chickens that do not have specific characteristics; in other words, they have diverse genotypes and phenotypes (Sartika, 2012). According to Fatmona & Nursjafani (2020), Kampung chickens are one of the biodiversity that play a significant role in maintaining ecosystem sustainability. Kampung chickens also play an important role in human life, serving as a source of animal protein to meet daily nutrient needs (Balaira et al., 2019). Kampung chickens can be classified as meat types (Pelung, Nagrak, Gaok, and Sedayu), layers (Black Kedu, White Kedu, Nusa Penida, Nunukan, Merawang, Wareng, and Sumatera chickens), and dual-purpose (Sentul, Bangkalan, Olagan, Kampung, Ayunai, Melayu, and Siem Chickens). In addition, there are also known cockfighting chicken types (Banten, Separate, Take, and Bangkok Chickens) and favourite/ornamental livestock, such as Pelung, Gaok, Tukung, Burgo, Bekisar, and Walik chickens (Nur et al.,

2022). These chickens have distinct and unique morphological characteristics according to their area of origin, which is spread throughout the Indonesian archipelago.

Kampung chicken is a popular poultry in Kalemago village. It is easy to adapt to the environment and can be raised with little capital (Saifullah et al., 2023). The Kalemago Village community raises Kampung chickens as a source of additional income. In addition, Kampung chickens are also used as a food source for meat and eggs. However, the population of Kampung chickens in Kalemago village remains small, so it is necessary to develop and increase their productivity. In addition, the high variety of Kampung chickens is essential as a genetic source for breeding programs through chicken crossbreeding in the future to produce new breeds with various advantages.

According to Suyuti (2019), the appearance of Kampung chickens is still very diverse, as they have different genetic characteristics, such as feather color, body size, and production capacity. This reflects the genetic diversity of Kampung chickens. Kampung Chicken has a unique appearance and varied feather colours; this chicken has darker feathers with attractive patterns. The diversity of traits in Kampung chicken is essential as a genetic source for breeding programs, as these traits, especially quantitative traits, affect the productivity of Kampung chicken.

Quantitative traits such as body size significantly correlate with live weight parameters (Nata et al., 2022). Quantitative traits are obtained by taking morphometric measurements of the livestock's body. In contrast, qualitative traits such as feather color, comb shape, and shank color are used to see the differences or similarities between one type of Kampung chicken and another (Yang et al., 2024). Therefore, it is necessary to have scientific information on the typical phenotypic characteristics of the quantitative and qualitative traits of Kampung chickens in Kalemago. This study aimed to measure and learn more about the quantitative and qualitative characteristics of Kalemago Kampung chicken (phenotypic). This study is expected to provide further information on quantitative traits as a basis for efforts to conserve genetic resources and for the purpose of developing Kampung chickens.

Material Method

The determination of the research location was carried out using the purposive sampling method, which involves selecting samples based on specific considerations determined by the researcher. Additionally, the sample size was determined using the Slovin formula, with a total population of 413 native chickens, resulting in a sample size of 81 chickens. The formula was as follows:

$$n = \frac{N}{1 + Ne^2}$$

Where:
n = The required sample size
N = Population size
E = Margin of error from the population size (10%)

The research method used was an exploratory research method where data collection was taken directly at the location by conducting direct observations of quantitative traits and measurements of the observed parameters, which include body parts: Femur length, Tibia length, Shank length, Chest circumference, and Back length. Then, the descriptive analysis was conducted by calculating the average population of the measured quantitative traits (μ), population standard deviation (σ), and diversity coefficient (DC). The formula was as follows:

$$\mu = \frac{\sum xi}{n} \qquad \sigma = \frac{\sqrt{\sum_{i=0}^{n}(Xi-\mu)^2}}{N}$$

$$CV = \frac{\sigma}{\mu} X\ 100$$

Where:
μ = Mean value of population parameters
∑ = Addition
Xi = Each value from the population
N = Number of parameters
σ = Population Standard Deviation
CV = Coefficient of Variation (%)

Observation Variables

The observation parameters in this study fell into two categories: qualitative and quantitative traits. Qualitative traits included feather colour (black, white, brown, yellow, red, and colour combinations), comb type (pea, single, walnut, and rose), beak colour (black, yellow, yellow-green, and brown), and shank colour (black, yellow, green, and white).

According to Johari (2018), qualitative traits are visible characteristics that cannot be measured using specific units. In contrast, quantitative traits are measurable characteristics influenced by multiple gene pairs and environmental factors (Fitriyah, 2021). Qualitative traits that exhibit variation included feather colour (white, black, brown, yellow, reddish-yellow, or combinations), comb shape (pea, single, walnut, and rose), shank colour (white, yellow, and black), and beak colour (white, yellow, and black). Meanwhile, quantitative traits included body weight, tarsometatarsus length, tibia length, femur length, wing length, pubic bone spacing, third toe length, and comb height (Fitriyah, 2021).

The linear size variables of the body surface are measured using calipers and measuring tape in millimeters with the following description: Femur length was measured along the thigh bone. Tibia length was measured from the patella to the tip of the tibia. The shank length was measured along the tarsometatarsus bone. Chest circumference was the circumference of the body measured from behind the base of the wings. The length of the back was measured from the base of the neck to the base of the tail.

RESULTS AND DISCUSSION

General Overview of Kalemago Village

Kalemago Village is one of five villages located in East Lore District, Poso Regency, Central Sulawesi, Indonesia. Geographically, most of Kalemago Village's area consists of mountainous terrain. Situated within the Napu Valley region, Kalemago Village is categorized as a highland area with an elevation of approximately 1,500 meters above sea level (District & Figures, 2024). This village is relatively isolated, as it is situated approximately 3 kilometres from the provincial road.

The majority of residents in Kalemago Village rely on agriculture, with coffee being the primary crop. Horticultural plants such as shallots, chillies, and eggplants are also commonly found in the village. Environmental factors, including feed availability, climate conditions, and management practices, play a crucial role in the growth and development of Kampung chickens. Situated in a highland area, Kalemago Village has unique environmental conditions that influence the phenotypic traits of Kampung chickens. Additionally, local community habits and traditions in raising chickens also impact the resulting phenotypes.

This study reveals that Kampung chickens in Kalemago Village exhibit significant phenotypic variation in both quantitative and qualitative traits. Such variation reflects genetic diversity that can be utilized in breeding programs to enhance the productivity and adaptability of Kampung chickens. Quantitative variations, such as body weight and body size, along with qualitative traits, such as feather color and comb type, provide valuable insights for the development of local native chickens.

Kampung Chicken Qualitative Trait

Results of observations on qualitative traits in Kalemago Village, East Lore District, Poso Regency, Central Sulawesi Province (Table 1).

The feather colour of Kampung chickens in Kalemago Village, East Lore District, Poso Regency, Central Sulawesi Province, is generally diverse, with brown being the most dominant colour. Other feather colours include black in various combinations. For instance, black-and-white Kampung chickens have a feather pattern combining black and white with stripes and spots. Black-and-yellow Kampung chickens have a dominant combination of black and yellow feathers, with small patches of red and white. Meanwhile, black-and-red Kampung chickens exhibit a feather pattern combining black and red with spots and stripes, as shown in Figure 1.

Based on taxonomy, chickens belong to the class Aves, order Galliformes, and family Phasianidae. Chickens have a comb on top of their head and two wattles under their chin (Edowai et al., 2019). The types of combs of Kampung chickens in Kalemago Village, East Lore District, Poso Regency, Central Sulawesi Province are pea, single, and walnut. The dominant comb type in Kampung chickens is the pea comb shape; this is supported by Riyanti et al. (2023) (Figure 2).

Table 1. Kampung chicken qualitative trait in Kalemago village

Qualitative traits	Number	
	Birds	Percentage (%)
Feather Colour		
Brown	18	23
Yellow	17	21
Black	11	14
Black-white	11	14
Black-yellow	6	7
Black-red	6	7
Black-brown	6	7
Red	6	7
Total	81	100
Comb shape		
Pea	35	43
Single	29	36
Walnut	11	14
None	6	7
Total	81	100
Shank colour		
Yellow	40	50
Green	29	36
White	6	7
Black	6	7
Total	81	100
Beak colour		
Yellow	53	65
Black	22	28
Brown	6	7
Total	81	100

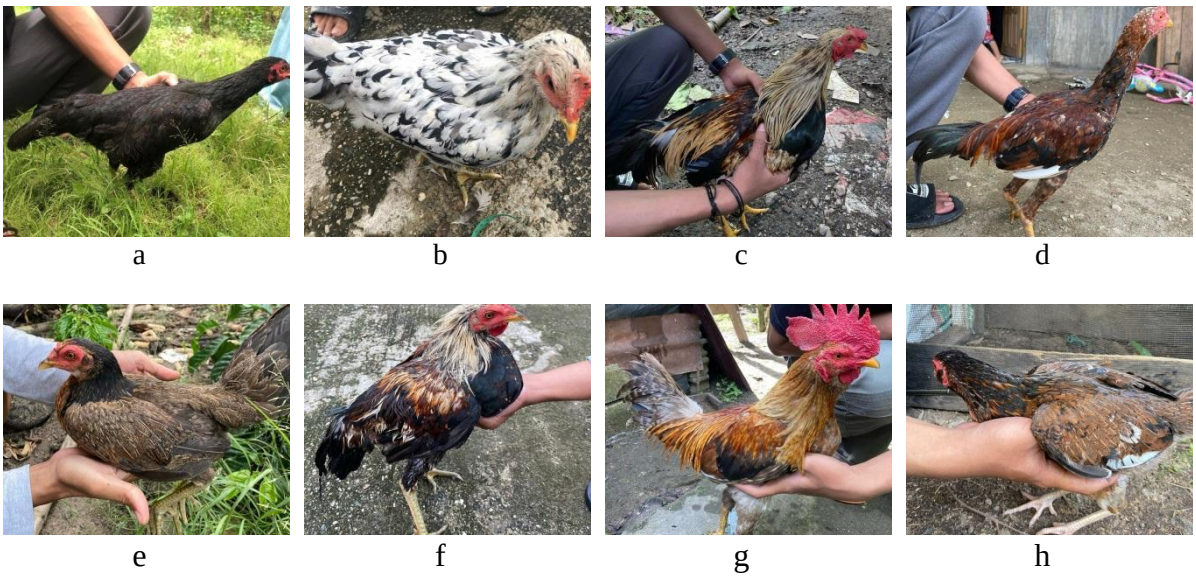
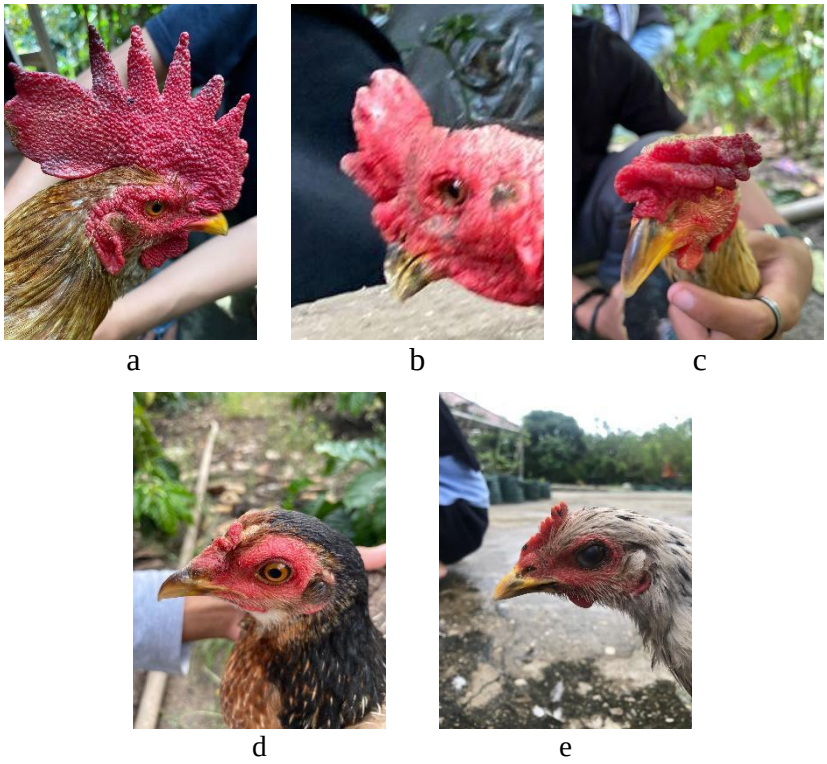


Figure 1. The colour of the kampung chicken in Kalemago village:
a. Black b. Black-and-white c. Black -and-yellow d. Black-and-red
e. Black-and-brown f. Yellow g. Red h. Brown



a b c d e

Figure 2. The shape of Kampung chicken comb in Kalemago village; a. Pea b. Single c. Walnut d. Pea e. Single

a b c d

Figure 3. Shank color of kampung chicken in Kalemago village; a. Green b. Black c. White d. Yellow

The beak colour of Kampung chickens in Kalemago Village, East Lore District, Poso Regency, Central Sulawesi Province, was yellow, black, and brown, with yellow being the most dominant colour. The beaks of Kampung chickens exhibited interesting colour variations, reflecting the uniqueness of each individual. These colour combinations not only enhance the appearance of the chickens' beaks but also represent their diverse characteristics and living environments. This finding aligns with the statement by Rangkuti et al. (2014), which suggests that beak colour reflects the relationship between Kampung chickens and their habitat.

The shank colour of native chickens in Kalemago Village was observed to be yellow, green, black, and white. According to Riyanti et al. (2023), black-coloured shanks result from the presence of melanin pigment in the epidermis. In contrast, white shanks are due to the absence of carotenoid and melanin pigments in both the epidermis and dermis. Additionally, Sartika et al. (2008) stated that yellow or white coloration is caused by a lack of melanin (black pigment) in the skin tissue. Melanin content is controlled by a sex-linked

recessive gene in either homozygous or heterozygous conditions, as shown in Figure 3.

Kampung Chickens Quantitative Trait

Results of observations on quantitative traits in Kalemago Village, East Lore District, Poso Regency, Central Sulawesi Province (Table 2).

Based on the categories proposed by Rahmadhani et al. (2022), the variation value can be categorized as high if it is more than or equal to 15%. The category of Kampung chicken diversity can be divided into three, namely high (CV 15%), medium (5% <CV < 15%), and low (CV 5%). The study's results on the quantitative characteristics of Kampung chickens describe several body sizes of Kampung chickens in Kalemago Village (Table 2). The average body weight of male Kampung chickens in Kalemago Village is 1.887, with a coefficient of variation of 25.2% ± 0.47. In female chickens, the average body weight is 1.105 kg, with a coefficient of diversity of 17% ± 0.19. This result is similar to the research of Nur et al. (2022), which stated that the average body weight of Kampung chickens is 1.39 kg/head in females.

The total size of the back length of the Kampung chicken Kalemago (table 2), namely in male chickens, showed an average of 19.04 cm with a coefficient of variation of 11.42% ± 2.03. Female chickens showed an average of 15.42 with a coefficient of variation of 9.27% ± 1.43. The results of this study are in accordance with the statement of Rahmadhani et al. (2022) that the highest coefficient of variation is in male chickens, with 10.13.

The chest is a place where more meat is deposited compared to other organs, therefore, the growth rate of the breastbone can be used as an indicator of how big or thin the livestock is (Widodo et al., 2012). In Table 2, the average chest circumference of male kampung chicken Kalemago is 31.24, with a coefficient of 9.71 ± 2.84. In female chickens, it shows an average of 27.17 with a coefficient of diversity of 10.77% ± 2.93. This result means that chest growth in male chickens is faster than in female chickens. This is consistent with Prananda et al. (2021), who stated that the body weight of male chickens is higher than that of female chickens because genetics influence growth rate. Sarfan and Rajab (2024) added that male chickens have better genetic potential for muscle growth, particularly in the breast area.

The femur is a long bone in the chicken's thigh that functions as the primary support for the body and helps with movement (Charles et al., 2020). According to Fatmona & Nursjafani (2020), the femur of male chickens is larger than that of females. This result was similar to Table 2, where the femur length of male Kampung chickens kalemago showed an average of 115.87, a coefficient of variation of 14.41% ± 15.62. As for female Kampung chickens, kalemago was 112.5, with a coefficient of variation of 19.83 ± 22.3.

The tibia is a part of the limb consisting of the tibia and fibula bones. It articulates directly ventrally with the tarsal bones and forms the tibiotarsal joint. The tibia functions to support the chicken's body, and the morphology of the tibia bone is influenced by the chicken's body weight (Pulcini et al., 2021). The total length of the tibia in the male Kampung chicken Kalemago from this study showed an average value of 143.25 with a coefficient of diversity of 10.36% ± 13.89. Meanwhile, female Kampung chickens showed an average of 115.83 with a diversity coefficient of 10.37 ± 12.

Table 2. Quantitative traits of Kampung chickens in Kalemago village

Quantitative Properties	Male			Female		
	Average	SD±	CV (%)	Average	SD±	CV (%)
Weight (kg)	1,887	0,47	25,21	1,105	0,19	17
Back length (cm)	19,04	2,03	11,42	15,42	1,43	9,27
Chest size (cm)	31,24	2,84	9,71	27,17	2,93	10,77
Femur size (mm)	115,87	15,62	14,41	112,5	22,3	19,83
Tibia size (mm)	143,25	13,89	10,36	115,83	12	10,37
Shank size (mm)	95,62	11,02	12,32	70,83	7,36	10,39

This result is in accordance with the research of Sitanggang et al. (2015) where the coefficient of the diversity of male chickens is lower than that of male chickens, in contrast to the research presented Milas et al. (2020) that male Kampung chickens are larger than female chickens, the results of this study are due to differences in the growth rate of livestock with one another.

The shank of a kampung chicken is a part of the foot consisting of the metatarsus bone, which is located between the ankle and the toes (Afonso et al., 2023). According to Rafian et al. (2023), the shank greatly affects the size of male chickens. Based on Table 2, the total average shank size in roosters was 96.62 mm, with a coefficient of variation of 12.32 ± 11.02%. As for female Kampung chickens, the total average size of the shank was 70.83, with a coefficient of diversity of 10.39 ± 7.36, where the shank size of male Kampung chickens is longer than that of female Kampung chickens. This finding is in line with the research of Permadi et al. (2020), which finds that bone growth in male Kampung chickens is faster than bone growth in female Kampung chickens. The results of this study are higher than the average size of Kampung chickens reported in studies by Sitanggang et al. (2015) and Rangkuti et al. (2014), which found smaller shank sizes in males than females, specifically 50 mm, 12 mm, and 10 mm, and 57 mm and 42 mm, respectively.

CONCLUSION

Kampung chickens in Kalemago Village, East Lore District, Poso Regency, have phenotypic variations in both quantitative and qualitative traits. Quantitative variations include body weight, back length, chest circumference, upper thigh bone length, lower thigh bone length, and shank length. Meanwhile, qualitative variations include feather colour, comb type, beak colour, and shank colour. This diversity is important as a genetic source for future kampung chicken breeding programs to increase the productivity and adaptability of these livestock. The information generated from this study can be used to develop Kampung chickens in Central Sulawesi, especially in Poso Regency, while also helping preserve local livestock genetic resources.

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