Identification performance of quantitative traits of Marica goats in Maros and Jeneponto regencies

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Abstract. Utilization of local goats in Indonesia that have good genetic potential cannot be characterized and utilized optimally even though the population has been successfully used. The Marica goat is one of Indonesia's original endemic goats found in Maros and Jeneponto regencies, South Sulawesi province. Currently Marica goats are hard to find, so the total population is unknown. Marica goat for conservation purposes as native goats South Sulawesi it takes information about the character or the morphology of Marica goat. The research material is 51 head of Marica goats and 65 head of Kacang goats aged around 2-3 years. The data obtained were processed descriptively, calculated average values, standard deviation values, coefficient of variation values, and independent t tests. The result of the identification of quantitative traits is that the body dimensions tend to be smaller than those of Kacang goat. Marica goats and Kacang goats have a high level of homogeneity (CV<20%).

1. Introduction

Utilization of local goats with good genetic potential, which has not been used optimally can provide better results. It is estimated that many more local goat Indonesian nation that can not be characterized and most probably endangered or extinct population is already approaching when we have not had time to explore the potential of genetic diversity to be used as a source of genetic quality improvement goats in Indonesia\[1\].

Marica goat located in South Sulawesi province is one of the original endemic Indonesian goat. Marica goat population areas include Maros, Jeneponto, Soppeng regencies and Makassar city. This original Indonesian goat already includes close to rare and endangered categories \[2\]. Marica goats since 2014 has been approved by the Decree of the Minister of Agriculture of the Republic of Indonesia No. 580/Kpts.SR.120/120/4/2014 as clumps of local native goats from South Sulawesi. The population of Marica goats in five regencies (Jeneponto, Maros, Soppeng, Makassar and Gowa) centers of South Sulawesi goats shows that the presence of Marica goats is 0.007% of the total goat population in South Sulawesi \[3\].

The development of science such as breeding technology and animal biotechnology, increasing market demand can encourage the exploitation of livestock through the crossing and replacement of new goat breed \[4\]. Excessive drainage of pure lines will threaten the genetic diversity of livestock. Whereas the preservation of animal genetic diversity is always needed in future breeding, because without genetic diversity, animal breeding is not possible to anticipate future needs, especially on
Marica goats. Marica and Kacang goats can produce quite well in unproductive environments that are often used for crossing activities by breeders to increase the productivity of local goats. However, uncontrolled crossing programs can have a negative impact on existing genetic potential. One way that the potential of Kacang and Marica goats can be put to good use is by utilizing the status of genetic diversity.

The body size of Marica goats is relatively smaller compared to other types of local goats so that breeders pay less attention to the existence of Marica goats. A lot of information states that Marica and Kacang goats are the same two breed. The absence of Marica goat conservation measures can accelerate the extinction of Marica goats as pure breed. Identification of goats can be done in two ways, namely quantitative and qualitative. Qualitative trait is a trait that can be directly observed or described, and individuals can be classified into one, two or more groups, such as the color of the feathers, the shape of the horns, and the shape of the ears. While quantitative traits are traits that cannot be grouped directly but must be done by weighing and measuring, such as body weight.

2. Materials and Methods
This research was conducted from March to August 2019, in the Maros and Jeneponto regencies. Data processing and analysis was carried at the Animal Breeding and Genetics Laboratory, Faculty of Animal Husbandry, Hasanuddin University, Makassar, South Sulawesi. This research was an observational study which included collecting body dimensions, body weight and total population of Marica and Kacang goats in Maros and Jeneponto districts. The type of data obtained is body dimensions such as Head Length (HL), Head Width (HW), Ear Length (EL), Ear Width (EW), Chest Width (CW), Chest Circumference (CC), Waist Height (WH), Body Length (BL), Chest Depth (CD), Shoulder Height (SH), Waist Width (WW) and Body Weight (BW). The data obtained in this study were processed descriptively, tabulated, calculated average values, coefficient of variation, standard deviation values and independent t-tests in each part measured.

3. Results and Discussion
The quantitative characteristics of Marica and Kacang goats by sex (male and female) and region (Jeneponto and Maros) and the results of independent t-tests are presented in tables 1, 2 and 3. Table 1 shows that the p-value between male Marica goats and male goats in Jeneponto regency which has a p<0.01 namely the parameters HL, HW, EL, EW, CD and CC. But the p-value SH, CC, BL and BW is p>0.05. P-value between female Marica and female Kacang goats in Jeneponto district which has a p>0.05 except for the EL parameter which has a p<0.05.

The length of the head (14.1 cm) and the width of the head (10.9 cm) in the local female goat Bone Bolango family which is shorter than the female Marica goat in Jeneponto district [6]. Measurement results on male and female Marica goats for ear length (11.6 cm and 10.3 cm) and ear widths (5.9 cm and 6.1 cm) are shorter than male and female Marica goats in Jeneponto regencies [1]. Ear length (14.9 cm) and ear width (7.1 cm) in Bone Bolango local female goats are longer compared to female Marica goats in Jeneponto regency except ear length [6]. The body sizes of male and female Marica goats are shoulder height (57.6 cm and 55.7 cm), chest circumference (51.7 cm and 54.4 cm), depth chest (23.0 cm and 27.6 cm), chest width (15.6 cm and 15.9 cm), waist height (59.7 cm and 50.6 cm), body length (58.6 cm and 56.4 cm) and higher body weight (22.8 cm and 20.6 cm) compared to male and female Marica goats in Jeneponto regency except for the chest circumference parameters and shoulder height in Marica goats female [7,8].
Ministry of Agriculture of the Republic of Indonesia No. 580/Kpts.SR.120/120/4/2014 states the body size of male and female Marica goats which are shoulder height (51.2 cm and 51.4 cm), chest circumference (61.3 cm and 63.7 cm), body length (58.67 cm and 54.92 cm) and body weight (19.17 and cm 20.88) which is longer than male Marica goats in Jeneponto regency except female Marica goats.

Table 1. Body measurement of Marica and Kacang goat, in Jeneponto district and independent t-test

| Body Measurement               | Male                | Kacang Goat         | CV (%)     | CV (%)     | P- Value |
|-------------------------------|---------------------|---------------------|------------|------------|----------|
|                               | (n: 16 head)        | (n: 4 head)         |            |            |          |
| Head Length (cm)              | 12.7 ± 0.93         | 14.5 ± 0.4          | 7.43       | 2.75       | 0.001    |
| Head Width (cm)               | 8.6 ± 1.06          | 11.3 ± 0.5          | 12.38      | 4.44       | 0.00     |
| Ear Length (cm)               | 11.9 ± 1.07         | 16.7 ± 2.86         | 8.94       | 17.25      | 0.00     |
| Ear Width (cm)                | 6.3 ±0.62           | 7.9 ± 0.85          | 9.96       | 10.8       | 0.001    |
| Shoulder Height (cm)          | 51.1 ± 4.11         | 54.3±4.03           | 8.05       | 7.42       | 0.18     |
| Chest Circumference (cm)      | 58.2 ± 4.30         | 59.5 ± 1.91         | 7.38       | 3.21       | 0.57     |
| Chest Depth (cm)              | 21.1 ± 1.80         | 24.8 ± 0.5          | 8.57       | 2.02       | 0.001    |
| Chest Width (cm)              | 12.3 ± 1.21         | 14.4 ± 0.47         | 9.85       | 3.27       | 0.004    |
| Waist Height (cm)             | 53.75 ± 4.17        | 56 ± 2.94           | 7.76       | 5.25       | 0.33     |
| Waist Width (cm)              | 7.53 ± 0.76         | 10.25 ± 0.95        | 10.13      | 9.33       | 0.00     |
| Body Length (cm)              | 48.31 ± 4.43        | 47.87 ± 6.3         | 9.18       | 13.17      | 0.87     |
| Body Weigh (kg)               | 17.18 ± 3.70        | 19 ± 1.41           | 21.58      | 7.42       | 0.93     |

The coefficient of variation (CV) body measurements of male and female Marica goats and male and female goats are at a high level of homogeneity (CV<20%). A coefficient of variation small than 20% is considered uniform and if a coefficient of variation greater than 20% is considered non-uniform [9]. The high level of homogeneity in Marica goat data can be caused by a lack of numbers. The smaller the coefficient of variation in a population shows the better quality of the population because it has a lower level of diversity. The low coefficient of variation in the properties of face length, face width, ear length, ear width indicates that these properties cannot be used as a basis for selection [10].

Table 2. shows that the p-value between male Marica goats and male goats in Maros District tends to have a p<0.01, namely the parameters HL, EL, EW, SH, CD, CC, WH, WW, BL and BW except for the HL and CC parameters that have a p<0.05 p-value between female Marica goats with female Kacang goats in Maros regency which have p>0.05 except for HL and EL parameters which have p<0.05 and those that have p<0.01, namely at BW parameter.
The length of the head (14.1 cm) and head width (10.9 cm) in the local female goat Bone Bolango family which is longer than the female Marica goat in Maros regency [7]. measurement results on male and female Marica goats for ear length (11.6 cm and 10.3 cm) and ear width (5.9 cm and 6.1 cm) which are shorter than male and female Marica goats in Maros regency (table 2) [7]. Ear length (14.9 cm) and ear width (7.1 cm) in Bone Bolango local female goats are longer than in female Marica goats in Maros regency [7].

The body sizes of male and female Marica goats are shoulder height (57.6 cm and 55.7 cm), chest circumference (51.7 cm and 54.4 cm), depth chest (23.0 cm and 27.6 cm), chest width (15.6 cm and 15.9 cm), waist height (59.7 cm and 50.6 cm), body length (58.6 cm and 56.4 cm) and higher body weight (22.8 cm and 20.6 cm) compared to male and female Marica goats in Maros

Ministry of Agriculture Republic of Indonesia No. 580/Kpts.SR.120/120/4/2014 states the body measurement of

Table 2. Body measurement of Marica and Kacang goat, in Maros district and independent t-test

| Body Measurement          | Marica            | CV (%) | Kacang         | CV (%) | P-Value |
|---------------------------|-------------------|--------|----------------|--------|---------|
| Male                      | (n: 10 head)      |        | (n: 15 head)   |        |         |
| Head Length (cm)          | 13.8 ± 2.14       | 15.51  | 15 ± 1.12      | 7.45   | 0.08    |
| Head Width (cm)           | 9.4 ± 1.34        | 14.26  | 12 ± 0.94      | 7.86   | 0.00    |
| Ear Length (cm)           | 12.6 ± 1.90       | 15.15  | 15.1 ± 0.92    | 6.12   | 0.00    |
| Ear Width (cm)            | 6.1 ± 0.91        | 14.97  | 7.4 ± 0.44     | 5.97   | 0.00    |
| Shoulder Height (cm)      | 45.3 ± 7.21       | 15.93  | 53.9 ± 3.46    | 6.42   | 0.001   |
| Chest Circumference (cm)  | 53.7 ± 7.49       | 13.95  | 62.5 ± 2.92    | 4.67   | 0.00    |
| Chest Depth (cm)          | 21.6 ± 2.87       | 13.31  | 24.7 ± 1.49    | 6.06   | 0.002   |
| Chest Width (cm)          | 13.1 ± 3.24       | 24.69  | 14.6 ± 1.29    | 8.89   | 0.12    |
| Waist Height (cm)         | 45.3 ± 7.21       | 15.93  | 53.9 ± 3.46    | 6.42   | 0.00    |
| Waist Width (cm)          | 53.7 ± 7.49       | 13.95  | 62.5 ± 2.92    | 4.67   | 0.001   |
| Body Length (cm)          | 21.6 ± 2.87       | 13.31  | 24.7 ± 1.49    | 6.06   | 0.00    |
| Body Weight (kg)          | 13.1 ± 3.24       | 24.69  | 14.6 ± 1.29    | 8.89   | 0.00    |
| Female                    | (n: 17 head)      |        | (n: 21 head)   |        |         |
| Head Length (cm)          | 15.2 ± 2.23       | 14.51  | 16.9 ± 2.20    | 13.07  | 0.05    |
| Head Width (cm)           | 10.1 ± 1.37       | 13.72  | 10.8 ± 1.14    | 10.64  | 0.09    |
| Ear Length (cm)           | 13.5 ± 1.62       | 12.05  | 14.6 ± 1.58    | 10.84  | 0.03    |
| Ear Width (cm)            | 6.9 ± 0.61        | 8.94   | 7.4 ± 0.82     | 11.13  | 0.06    |
| Shoulder Height (cm)      | 52.5 ± 4.40       | 8.39   | 54.7 ± 5.24    | 9.59   | 0.18    |
| Chest Circumference (cm)  | 64.5 ± 6.38       | 9.83   | 68.1 ± 6.61    | 9.71   | 0.14    |
| Chest Depth (cm)          | 26.1 ± 3.32       | 12.71  | 28.4 ± 5.39    | 19.01  | 0.14    |
| Chest Width (cm)          | 14.6 ± 3.24       | 22.21  | 16.7 ± 3.83    | 22.88  | 0.10    |
| Waist Height (cm)         | 52.5 ± 4.40       | 8.39   | 54.7 ± 5.24    | 9.59   | 0.08    |
| Waist Width (cm)          | 64.5 ± 6.38       | 9.83   | 68.1 ± 6.61    | 9.71   | 0.43    |
| Body Length (cm)          | 26.1 ± 3.32       | 12.71  | 28.4 ± 5.39    | 19.01  | 0.12    |
| Body Weight (kg)          | 14.6 ± 3.24       | 22.21  | 16.7 ± 3.83    | 22.88  | 0.006   |

HL: Head Length; HW: Head Width; EL: Ear Length; EW: Ear Width; SH: Shoulder Height; CC: Chest Circumference; CD: Chest Depth; CW: Chest Width; WH: Waist Height; WW: Waist Width; BL: Body Length; BW: Body Weight; CV: Coefficient Variation.
The coefficient of variation (CV) of the body measurement of male and female Marica goats and male and female goats are at a high level of homogeneity (CV < 20%) except for the width of the chest. Marica goats have a high level of homogeneity (CV < 20%) [11]. The high level of homogeneity in Marica goat data can be due to the minimal population. Populations that are not too large tend to increase homozygosity which affects the high level of uniformity. The low coefficient of variation in the characteristics of shoulder height, chest circumference, in the chest indicates that these properties cannot be used as a basis for selection [12].

Table 3. shows that the p-value between male Marica goats in Jeneponto regency and male Marica goats in Maros regency has p < 0.01 in the parameters SH, HW, WW, BL, and BW except for the parameters HL, HW, EL, EW, CC, CD and CW, which have p > 0.05.

P-value between male Marica goats and female Marica goats in Jeneponto regency and female Marica goats in Maros regency tends to have a p > 0.05 except for the parameters SH and HW which have p < 0.05 and those that have p > 0.01, namely the parameters EL and WW.

Table 3. Body measurement of Marica goat in Jeneponto and Maros district and independent t-test

| Body Measurement       | Jeneponto CV (%) | Maros CV (%) | p-Value |
|------------------------|------------------|--------------|---------|
| Head Length (cm)       | 12.7 ± 0.93 (n: 16 head) | 13.8 ± 2.14 (n: 10 head) | 0.06    |
| Head Width (cm)        | 8.6 ± 1.06       | 9.4 ± 1.34   | 0.09    |
| Ear Length (cm)        | 11.9 ± 1.07      | 12.6 ± 1.90  | 0.31    |
| Ear Width (cm)         | 6.3 ± 0.62       | 6.1 ± 0.91   | 0.4     |
| Shoulder Height (cm)   | 51.1 ± 4.11      | 45.3 ± 7.21  | 0.01    |
| Chest Circumference (cm)| 58.2 ± 4.30 | 53.7 ± 7.49  | 0.06    |
| Chest Depth (cm)       | 21.1 ± 1.80      | 21.6 ± 2.87  | 0.56    |
| Chest Width (cm)       | 12.3 ± 1.21      | 13.1 ± 3.24  | 0.37    |
| Waist Height (cm)      | 53.75 ± 4.17     | 45.3 ± 7.21  | 0.93    |
| Waist Width (cm)       | 7.53 ± 0.76      | 53.7 ± 7.49  | 0.004   |
| Body Length (cm)       | 48.31 ± 4.43     | 21.6 ± 2.87  | 0.002   |
| Body Weight (kg)       | 17.18 ± 3.70     | 13.1 ± 3.24  | 0.001   |

| Female                 |
|------------------------|
| Head Length (cm)       | 14.6 ± 0.86 (n: 8 head) | 15.2 ± 2.23 (n: 17 head) | 0.30    |
| Head Width (cm)        | 9.6 ± 0.79       | 10.1 ± 1.37  | 0.40    |
| Ear Length (cm)        | 15.1 ± 0.62      | 13.5 ± 1.62  | 0.01    |
| Ear Width (cm)         | 6.9 ± 0.62       | 6.9 ± 0.61   | 0.92    |
| Shoulder Height (cm)   | 57.4 ± 4.30      | 52.5 ± 4.40  | 0.02    |
| Chest Circumference (cm)| 66.6 ± 3.96 | 64.5 ± 6.38  | 0.50    |
| Chest Depth (cm)       | 26.4 ± 2.66      | 26.1 ± 3.32  | 0.87    |
| Chest Width (cm)       | 14.4 ± 1.84      | 14.6 ± 3.24  | 0.76    |
| Waist Height (cm)      | 60.12 ± 4.70     | 52.5 ± 4.40  | 0.02    |
| Waist Width (cm)       | 8.75 ± 1         | 11.42        | 0.01    |
| Body Length (cm)       | 56.25 ± 2.81     | 26.1 ± 3.32  | 0.06    |
| Body Weight (kg)       | 24 ± 3.11        | 14.6 ± 3.24  | 0.06    |

HL: Head Length; HW: Head Width; EL: Ear Length; EW: Ear Width; SH: Shoulder Height; CC: Chest Circumference; CD: Chest Depth; CW: Chest Width; WH: Waist Height; WW: Waist Width; BL: Body Length; BW: Body Weight; CV: Coefficient Variation.

The growth rate after weaning is determined by several factors including the growth potential of each animal and available feed. Growth potential is influenced by national and gender factors. Animal growth patterns depend on the maintenance system, available feed, health and climate [13]. The rate of weight body is influenced by age, environment and genetic where the initial body weight of the
fattening phase is related to adult weight. Growth dimensions of the animal's body are genetically influenced by a ratio of 20-30%: 70-80% to the environment [14].

The coefficient of variation (CV) values on the body dimensions of male Marica goats in Jeneponto and Maros regencies are at a high level of homogeneity (CV<20%). The smaller the coefficient of variation, the more uniform the data (homogeneous), conversely the greater the coefficient of variance the more varied the data (heterogeneous) [15]. The higher the standard deviation, the greater the deviation of the data from the calculated average, so it is said to have high variability [16]. The meaning was data between body dimensions are heterogeneous and standard deviation is one statistical measure used to explain group of homogeneity.

Table 4. Body measurement of Kacang goat in Jeneponto and Maros districts and independent t-test

| Body Measurement          | District    | Male            | Female           |
|---------------------------|-------------|-----------------|------------------|
|                           | Jeneponto   | CV (%)          | Maros            | CV (%)          | p-Value |
| Head Length (cm)          | (n: 4 head) | 14.5 ± 0.4      | 14.9 ± 0.86      | 14.2 ± 0.5      | 0.00    |
| Head Width (cm)           |             | 11.3 ± 0.5      | 9.5 ± 0.65       | 11.8 ± 0.17     | 0.40    |
| Ear Length (cm)           |             | 16.7 ± 2.86     | 15.0 ± 1.77      | 16.2 ± 4.87     | 0.00    |
| Ear Width (cm)            |             | 7.9 ± 0.85      | 7.4 ± 0.74       | 7.4 ± 0.70      | 0.00    |
| Shoulder Height (cm)      |             | 54.3±4.03       | 53.9 ± 3.46      | 54.4 ± 3.24     | 0.00    |
| Chest Circumference (cm)  |             | 59.5 ± 1.91     | 58.5 ± 1.05      | 59.0 ± 1.89     | 0.00    |
| Chest Depth (cm)          |             | 24.8 ± 0.5      | 24.7 ± 1.49      | 24.7 ± 1.49     | 0.00    |
| Chest Width (cm)          |             | 14.4 ± 0.47     | 14.6 ± 1.29      | 14.6 ± 1.29     | 0.00    |
| Waist Height (cm)         |             | 56 ± 2.94       | 52.5 ± 3.24      | 53.9 ± 3.46     | 0.00    |
| Waist Width (cm)          |             | 10.25 ± 0.95    | 9.33 ± 0.84      | 62.5 ± 2.92     | 0.00    |
| Body Length (cm)          |             | 47.87 ± 6.3     | 24.7 ± 1.49      | 24.7 ± 1.49     | 0.00    |
| Body Weigh (kg)           |             | 19 ± 1.41       | 14.6 ± 1.29      | 14.6 ± 1.29     | 0.00    |

Table 4. shows that the p-value between male Kacang goats in Jeneponto regency and male Kacang goats in Maros regency tends to have a p>0.05 except for the WW parameter, which is p<0.01. P-value between male Marica goats and female Kacang goats in Jeneponto regency and female Kacang goats in Maros regency tends to have a p>0.05 except for the HW parameter (cm) which has a p<0.05 and those that have p<0.01, namely the parameters HL, HW, SH, and WW.

The dimensions of the body measurement are the result of a process of continuous growth and development without stopping throughout the livestock life. Growth is influenced by several factors, including genetic or hereditary and environmental factors such as climate and implementation management. Livestock growth is influenced by various factors including breed, sex, feed, health, age
of Does and birth weight. Sex gives a significant effect on body weight of male goats is higher than females of the same age [12].

The coefficient of variation (CV) value on the body dimensions of male Marica goats in Jeneponto and Maros regency are at a high level of homogeneity (CV<20%). A coefficient of variation smaller than 20% is considered uniform and if a coefficient of variation greater than 20% is considered non-uniform [8]. The high level of homogeneity in Marica goat data can be caused by a lack of numbers. Populations that are not too large tend to increase homozygosity which affects the high level of uniformity. The low coefficient of variation in the characteristics of shoulder height, chest circumference, chest depth indicates that these properties cannot be used as a basis for selection [17].

4. Conclusion
The body measurement of Marica goats tend to be smaller compared to Kacang. Marica goats have a coefficient of variation that has a high degree of homogeneity so that selection is still difficult, pure-blooded Marica goats in Jeneponto and Maros districts have not been found in either location, and Marica goats found are still has a characteristic Marica goat in the shape of its ears but is no longer pure.

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