Measurement of Body Characteristics and Vital Parameters in Saanen, Sapera, and Ettawa Crossbred Goats

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Abstract. Vital parameters (respiratory, pulse, rectal temperature, capillary refill time (CRT), rumen movement, and eating time) and body characteristics measurement of Apparently Healthy in 60 healthy Ettawa crossbred goats, Saanen goats, and Sapera goats in Indonesia were evaluated. The correlation between respiratory rate, pulse rate, and rectal temperature was measured. Respiratory rates (breaths per minute) were 59.68±21.29 in Ettawa Crossbred, 58.57±14.09 in Saanen, and 60.56±14.99 in Sapera. Pulses (pulsations per minute) were 87.54±19.70 in Ettawa crossbred, 90.46±18.36 in Saanen, and 86.82±13.69 in Sapera. Rectal temperatures (°C) were 39.18±0.51 in Ettawa Crossbred, 39.14±0.69 in Saanen, and 38.95±0.61 in Sapera. CRT (second) were 1.96±1.64 in Ettawa crossbred, 2.21±1.19 in Saanen, and 2.76±1.75 in Sapera. Rumen Movement (times/5 min) was 5.08±1.73 in Ettawa crossbred, 5.64±1.69 in Saanen, and 4.59±1.91 in Sapera. Eating time (seconds) were 66.62±13.43 in Ettawa crossbred, 55.45±18.38 in Saanen, and 62.34±19.44 in Sapera. Height (cm) was 70.62±14.27 in Ettawa crossbred, 60.56±7.55 in Saanen, and 61.72±9.37 in Sapera. Body length (cm) was 62.12±13.36 in Ettawa crossbred, 54.44±9.00 in Saanen, and 54.17±11.98 in Sapera. Chest circumference (cm) was 85.04±18.05 in Ettawa crossbred, 82.12±16.98 in Saanen, and 78.00±16.84 in Sapera. Chest depth (cm) was 30.88±5.68 in Ettawa Crossbred, 30.25±5.59 in Saanen, and 27.88±6.20 in Sapera. Ear length (cm) was 29.17±5.92 in Ettawa Crossbred, 16.25±1.95 in Saanen, and 20.22±3.14 in Sapera. Overall there was no correlation (R=0.36) between the rectal temperature and respiratory with pulses (R=0.06). This finding is the first-established vital parameters and body characteristics measurement in Healthy in Ettawa crossbred goats, Saanen goats, and Sapera goats in Indonesia.

1. Introduction

Sapera is a crossbreed between the Saanen breed goat and Etawa crossbred goat [1]; is a new generation of dairy goat in Indonesia to support Indonesia to reach milk self-sufficiency in 2024. There have been obstacles in the livestock improvement of these goats; there is no database yet of vital signs and body measurement or phenotypic characterization. The vital signs are important as the first clue of the presence of a disease [2], a good indicator of health status and nutrition [3]. A good selection of goats needs indicators or phenotypic parameters from body length, heart girth, growth rate, etc to predict body weight and its correlation to predict meat production [4] or milk production. In addition, the qualitative characteristics of the goats determine the classification of the grade of goats [5], breed identification, and tools of management to raised [4]. Other researchers have reported that scrotal circumference has a positive correlation with body weight in young Kejobong bucks [6], milk production[1]. In Kacang goats, it has been reported that semen quality was influenced by the length of epididymal ductus[7]. Application of body measurement and its index or phenotypic
characterization is used to assess the type and function of goats [8], and different animal has indicated variation in their vital signs and body measurement; therefore, the aim of this research was to evaluate the values of body measurement and vital parameters in Ettawa crossbred, Saanen and Sapera goats.

2. Material and methods

2.1. Ethical approval

All of the procedures in this research had been approved by the Ethics Committee of Ethical Clearance for Pre-Clinical Research, Integrated Research and Testing Laboratory, Universitas Gadjah Mada, Yogyakarta, Indonesia with a license number 00035/04/LPPT/VII/2019.

2.2. Place and animal

Sixty healthy crossbred Ettawa goats, Saanen, and Sapera (suckling lambs/weaners post-weaning 6-8 months with bodyweight 10-12 kg, ewe lamb 8-12 month and bodyweight 15-20 kg, lactating ewes 2-4 years and bodyweight 25-30 kg, rams 2-4 years with bodyweight 30-40 kg, pregnant 3-4 years with bodyweight 30-35kg) were used in this research. Each animal was kept in an individual cage in Seyegan, Sleman, Yogyakarta. The area’s average elevation is 155 m, and the research was conducted from April to May 2019. Height, body length (BL), and chest circumference were assessed according to Winaya et al. [1], Chacón et al. [9], and Abd-Allah et al.[4]; chest depth was measured according to Chacón et al. [9] and Abd-Allah et al. [4]. Ear length was measured according to Rasminati [5]. Vital signs including respiratory, pulse, rectal temperature, capillary refill time (CRT), rumen movement, and eating time were taken from 8 am to 10 am. Respiratory, pulses, rectal temperature, and rumen movement were measured according to Widiyono et al.. [10] and Adedeji [11]. CRT was assessed according to Sousa et al. [12]. Eating time was assessed according to Domingue et al.. [13] and Subhan et al.[14].

2.3. Statistical analysis

The data of vital signs and body measurements were analysed through descriptive statistics. The correlation among rectal temperature, pulse, respiratory of overall three breeds, and each breed was analyzed.

3. Result and Discussion

3.1. Body measurement

The data of body measurement for the three breeds are shown in table 1. The data show that heights in Ettawa crossbred (70.62±14.27cm) tend to be higher than Saanen (60.56±7.55cm) and Sapera (61.72±9.37cm). The heights of Ettawa crossbred tend to be higher than the heights among Ettawa crossbred goats reported by Winaya et al. [1], which was 77.75±4.46cm, and by Ministry Agriculture Republic of Indonesia [15], which is 87.00±5.00cm in male goats and 75.00±5.00 cm in female goats. The heights of the Saanen in this research agree with heights of the purebred Saanen in Turkey [16], which is 66.94±0.50 cm. The heights of the Sapera found in this research were shorter than the Sapera in Cilacap [1], which is 74.21±3.46cm. The body length of Ettawa crossbred was 62.12 ±13.36cm and tended to be longer than that of the Saanen (54.44 ±9.00cm), and the Sapera (54.17cm ±11.98cm). The body length of Ettawa crossbred found in this research agrees with the standard issued by the Ministry Agriculture of Republic of Indonesia [15], which is 63.00±5.00cm in male goats and 60.00 ±5.00cm in female goats but shorter than the body length in Ettawa crossbred goats reported by Winaya et al.. [1], which is 74.23±6.34cm and with Shami goats (76.26±10.09cm)[4]. The body length in the Saanen found in this research is shorter than the purebred Saanen in Turkey [16], which is 109.75±0.89cm. The body length of the Sapera found in this research is shorter than that of the Sapera in Cilacap, which is 71.30±4.17cm [1]. The chest circumference of Ettawa crossbreed (85.04cm±18.05cm) tended
to be higher than that of the Saanen (82.12 cm ± 16.98 cm) and the Sapera (78.00 cm ± 16.84 cm). The chest circumference of the Ettawa crossbreed found in this study is in accordance with that of the Ettawa crossbreed (85.45 cm ± 7.07 cm) [1] but shorter than that of the Ettawa crossbreed determined by the Ministry Agriculture of Republic of Indonesia [15], which is 89.00 ± 5.00 cm in male goats and 81.00 ± 7.00 cm in female goats. The chest circumference in the Sapera found in this study is in accordance with that of the Sapera in Cilacap (85.61 cm ± 4.46 cm) and Bogor (90.97 ± 2.42 cm) [1] but shorter than that of Savannah Brown goats (52.4 cm) [17] and longer than that of the adult female Ettawa crossbred in lowland areas (77.38 cm and 79.57 cm) in highland areas [5]. The chest depths found in this study were as follow: the Ettawa crossbred – 30.88 cm ± 5.68 cm, the Saanen – 30.25 cm ± 5.95 cm, and the Sapera – 27.88 cm ± 6.20 cm. These were shorter than those of the Shami goats (34.83 cm ± 4.06 cm) [4] and the purebred Saanen in Turkey [16] at 32.54 ± 4.4 cm. The Ear length of the Ettawa crossbred (29.17 cm ± 5.92 cm), the Saanen (16.25 cm ± 1.95 cm), and the Sapera (20.22 ± 3.14 cm) were longer than the Creole goats (12.68 cm ± 0.78 cm) but concordance result with Cuban crossbred goats (15.63 cm ± 9.66 cm) [9].

Table 1. The body measurement of the Ettawa crossbred, the Saanen, and the Sapera goats

| Breed of goats | Height (cm) | Body circumference (cm) | Chest depth (cm) | Ear length (cm) |
|----------------|-------------|-------------------------|-----------------|-----------------|
| Ettawa crossbred | 70.62 ± 14.27 | 85.04 ± 18.05 | 30.88 ± 5.68 | 29.17 ± 5.92 |
| Saanen | 60.56 ± 7.55 | 82.12 ± 16.98 | 30.25 ± 5.95 | 16.25 ± 1.95 |
| Sapera | 61.72 ± 9.37 | 78.00 ± 16.84 | 27.88 ± 6.20 | 20.22 ± 3.14 |

3.2. Vital signs
The data of vital signs for the three breeds are shown in table 2. The means of respiratory in the Ettawa crossbred, the Saanen, and the Sapera were 59.68 ± 21.29 breaths per minute, 58.57 ± 14.09 breaths per minute, and 60.56 ± 14.99 breaths per minute respectively. All of these were higher than the respiratory of the West African Dwarf Goats in Abeokuta, in Nigeria (25 ± 1.9 breaths per minute) [2] but lower than the respiratory of the Ettawa crossbred goats during one to three days of the postnatal life (78.73 ± 15.96 breaths per minute) [10]. In this research, although different body measurement, sex, and age of the three breed goats but breaths were of comparable values, other researchers found that breaths were higher in the evening than in the morning [2] in the late dry season and among the male goats [11]. The pulse rate of the Ettawa crossbred (87.54 ± 19.70 pulsations per min), the Saanen (90.46 ± 18.36 pulsations per min), and the Sapera (86.82 ± 13.69 pulsations per min) indicated normal parameter according to Radostits et al. [18] (70.00-90.00 pulsations per min), which was lower than in 90-day old Ettawa crossbred (113.19 ± 11.47 pulsations per min) [10] and it was in accordance with that of the West African Dwarf Goats (82.00 ± 7.30 pulsations per min) [2], Adedeji [11] noted that higher pulsations occur in the evening than in the morning [11]. The rectal temperatures of Ettawa crossbred goats were 39.18 ± 0.51 °C, Saanen were 39.14 ± 0.69 °C, and Sapera goats were 38.95 ± 0.61 °C, all of which were in accordance with those of the West African Dwarf Goats (38.80 ± 0.40 °C) [2] and the Ettawa crossbred goats (39.06 ± 0.30 °C). The CRTs found in this study are as follows: the Ettawa crossbred goats 1.96 ± 1.64 seconds, the Saanen goats 2.21 ± 1.19 seconds, and the Sapera goats 2.76 ± 1.75 seconds, all of which were lower than sheep in Brazil (1.60 seconds) [12]. The CRTs found in this study indicated that the three breeds of goats were in a good circulation system [12]. The rumen movements found in this study were as follows: the Ettawa crossbred 5.08 ± 1.73 times/5 min, the Saanen goats 5.64 ± 1.69 times/5 min, the Sapera 4.59 ± 1.91 times/5 min, and these agreed with the normal parameter [19], but they were shorter than those in 90-day old Ettawa crossbred goats (7.48 ± 1.75 times/5 min) [10]. The eating times found in this research were as follow: the Ettawa
crossbred goats – 66.62±13.43 seconds, the Saanen goats – 55.45±18.38 seconds, and the Sapera – 62.34±19.44 seconds, all of which were in accordance with those in Priangan sheep[14]. Goetsch et al.[20] reported that eating time of Boer is longer in summer than that of Mamber goats.

**Table 2.** Vital signs of the Ettawa crossbred, the Saanen, and the Sapera.

| Breed of goats | Respiratory (per minute) | Pulse (pulsations per min) | Rectal temperature (°C) | CRT (seconds) | Rumen Movement (times/5 min) | eating time (seconds) |
|----------------|--------------------------|-----------------------------|-------------------------|---------------|----------------------------|---------------------|
| Ettawa crossbred | 59.68±21.29             | 87.54±19.70              | 39.18±0.51             | 1.96±1.64     | 5.08±1.73                  | 66.62±13.43         |
| Saanen          | 58.57±14.09             | 90.46±18.36              | 39.14±0.69             | 2.21±1.19     | 5.64±1.69                  | 55.45±18.38         |
| Sapera          | 60.56±14.99             | 86.82±13.69              | 38.95±0.61             | 2.76±1.75     | 4.59±1.91                  | 62.34±19.44         |

3.3. Correlation

Overall, there was not any correlation (R=0.36) between the rectal temperatures and respiratory and the pulse (R=0.06). In the Ettawa crossbred goats, there was no correlation (R=0.06) between the rectal temperature and respiratory and the pulse (R=0.07). In the Saanen goats, there was no correlation (R=0.95) between the rectal temperature and respiratory and pulses (R=0.46). In the Sapera goats there was no correlation (R=0.50) between the rectal temperature and respiratory and the pulse (R=0.75). Other reports show that among kids there is a correlation among their body temperatures, pulse, and respiratory rate.

4. Conclusion

In conclusion, there were variations in body measurement and ages but no variations in vital sign parameters. These indicated that these parameters can be used as clinical evaluations in the Ettawa crossbreed, the Saanen, and the Sapera in the same location and situation. It is recommended that growth performance of each breed can improve in terms of body measurement and biological evaluation of vital signs. Bigger sample size, influences of various physiological status, and gender are needed to clarify estimates of live body weight and milk production based on body measurement, influencing seasons, size, physiological status, and time of day in vital signs.

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