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Methodologies for ribeye area determination in goats

E.A. Yáñez [a,*], A.C.D. Ferreira [b], A.N. Medeiros [c], J.M. Pereira Filho [d], I.A.M.A. Teixeira [e], K.T. Resende [e]

[a] *Department of Animal Production, Faculty of Veterinary Sciences, National University of North-East, Sargento Cabral 2139, Corrientes, CP 3400, Argentina*
[b] *Unoeste, Presidente Prudente, SP, Brazil*
[c] *Departamento de Zootecnia, CCA, UFPB, Areia, PB, Brazil*
[d] *Departamento de Medicina Veterinária, UFCG, Patos, PB, Brazil*
[e] *Departamento de Zootecnia, Faculdade de Ciências Agrárias e Veterinárias, Unesp. Via de acesso Paulo Donato Castellane s/n. Jaboticabal 14884-900, SP, Brazil*

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Abstract

The aim of this study was to evaluate the accuracy of a number of methodologies, i.e. PLANIMETER, GEOMETRIC, GRID, UNESP-GRID, UFSM, ZEISS and DELTA-T, in determining ribeye area (REA) of 65 Saanen goats of varying body condition. Goats were grouped according to body weight at slaughter (5.3, 11.2, 12.9, 16.4, 21.0, 22.1, 27.7, 28.6 and 35.2 kg). Tracing based on transverse section between the 13th thoracic and 1st lumbar vertebrae was used to determinate REA. There was no significant interaction between methodologies and body weight at slaughter. PLANIMETER, UNESP-GRID, GEOMETRIC and UFSM methods were similar in average values to the standard DELTA-T method. The REA was overestimated by the GRID and underestimated by the ZEISS method. The UNESP-GRID, GEOMETRIC and UFSM methods have coincident curves comparable to DELTA-T, when used to estimate goat REA. The UNESP-GRID and GEOMETRIC were the methods of choice based on accuracy, practicality and feasibility.

Keywords: REA; Grid; Planimeter; Goats; Carcass

1. Introduction

The increase in goat-meat consumption and demand for quality meat supports the identification of methods for lean muscle yield evaluation in carcasses. In this context, the relative proportions of muscle and muscle/bone ratio are important carcass traits that could provide meat content estimations. According to Macedo et al. (2000), ribeye area (REA) is an objective measurement for the prediction of meat content. USDA (US Department of Agriculture) Yield Grade plastic grid REA bovine carcass evaluation has an important influence on carcass classification and meat final price. For this reason, it is necessary that the methods used for the estimation of REA be as accurate as possible. Furthermore, it should be practical, economic and easy to apply, especially for carcass evaluation at the slaughterhouse. Previous studies have also reported on the accuracy and precision of video

* Corresponding author. Tel.: +54 3783 425753; fax: +54 3783 425753.
E-mail address: eyanez@vet.unne.edu.ar (E.A. Yáñez).

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imaging systems for estimating REA (Belk et al., 1998; Cannell et al., 1999).

The Meat Research Institute in UK considered maximum width and depth in estimating REA (geometric method) for sheep carcass evaluation (Brown and Williams, 1979), which was recommended by Fisher and Boer (1994). Recently, computerized systems has been employed to reduce errors or differences conferred by operators, for example, an Autocad computerized system for ovine (Macedo et al., 2000) and Viascan (Cannell et al., 1999) for bovine carcasses. However, there are no specific methodologies to evaluate goat carcass. Consequently, researchers have been are obliged to adapt bovine or ovine methodologies. Considering the similarity of size and anatomical traits of REA region between goat and sheep at equal weights, it seems logical to utilize the same methods sensibly for these two species. According to Cochran and Cox (1957), accuracy is the closeness in which a measurement approaches its true value. The objective of the present study was to evaluate the accuracy of different methods for predicting REA in goats slaughtered at different body conditions and varying weights.

2. Material and methods

The carcasses of 65 Saanen kids were used for determination of REA. The Goat Breeding Section of Agrarian and Veterinarian Science College (UNESP, Jaboticabal City, São Paulo State, Brazil) provided the animals for the study, which were raised during the period from 1999 to 2001 and fed different diets. The body condition of the kids, which varied from 1 to 3 (Morand-Fehr and Herviev, 1989), were grouped into nine groups based on body weight at slaughter (5.1–35.5 kg).

After chilling at 5 °C for 24 h, carcasses were split along the vertebrae and the left side was separated between the 13th thoracic and 1st lumbar vertebrae. In each carcass, the ribeye was measured by tracing on acetate paper for the estimation of REA, based on the following:

- PLANIMETER: a Polar compensation planimeter (mark: A-OTT, type: 31L), with fixed base and direct reading (cm^2), measured at least twice, until the difference between two readings were less than 0.1 cm.
- GEOMETRIC: the ribeye width (A) and depth (B) were measured with a dial caliper paquimeter (model: PB 150G, minimum scale: 0.1 mm) and transformed ($A/2 \times B/2 \times \pi$). The width was the maximum distance from the medial border to the lateral extremity of longissimus thoracis et lumborum. The depth was the maximum distance perpendicular to the width, localized adjacent to the lateral edge of the vertebrae.
- GRID: a reticulated grid (the same used in the USDA Yield Grade classification system), divided in 1-cm^2 squares with one dot in the middle. Measurement was made by addition of all squares found inside of the ribeye tracing perimeter and those that where in the contour of the tracing passed through the middle dot.
- UNESP-GRID: a grid developed by the authors similar to the USDA Yield Grade system, but differing in having squares of 0.25 cm^2 area and measured as described for GRID above.
- UFSM: measured in cm^2 with a digitalization system by dots (RG–SISTER 1.0–DIGITALIZAÇÃO), using software developed by Universidade Federal de Santa Maria, Rio Grande do Sul, Brazil.
- ZEISS: Karl Zeiss Vision software (KS100 Imagining System Release 3.0, 1997) that allowed tracing a continuous line over the contour of the ribeye: measured in mm^2.
- DELTA-T: a painted photocopy ribeye tracing based on Delta–T software (Digital Image Analysis system, Version 1.2, 1993, Copyright Delta–T Devices Ltd, 128 Low Road Burwell. Cambs, UK): measured in cm^2.

The possibility of operator interference on results based on the Delta-T system do not exist except during the drawing of the ribeye on acetate paper, therefore, it was chosen as the standard method to compare with other systems.

A regression of REA estimation, based on body weight for each methods and identity test (Steel and Torrie, 1980), was utilized to verify the existence of coincidence and/or parallelism among methods and the DELTA-T system. The mathematical model included fixed effects due to methodology (PLANIMETER, GEOMETRIC, GRID, UNESP-Grid, UFSM, ZEISS and Delta-T), body weight groups (5.1–35.5 kg, nine groups) and residual error. Differences among means were tested for significance based on Tukey's test (SAS Institute, 1993).

3. Results and discussion

Least-square means (±S.E.) for ribeye area, based on seven methods and the identity test of the regression estimates, are presented in Table 1. There was no significant interaction between methodologies and body weight at slaughter, therefore, differences among body weight groups will not be discussed further.