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Composición tisular de la canal en diferentes razas ovinas de pelo criadas en el sureste de México

Carcass tissue composition in different hairs sheep breeds reared in southeastern Mexico

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Abstract:

The objective of this work was to review the information about the research on carcass traits and carcass tissue composition in hair sheep in southeastern Mexico. The available information revealed that the main methods, "*in vivo* measurements" have been investigated, such as ultrasonography measurements and biometric measurements; and "*post-mortem* measurements" such as dissection of primal cuts (neck, shoulder, and 9-11 rib section) and carcass measurements I hair sheep breeds raised in southeastern Mexico.

Keywords:

Carcass composition, sheep breeds, sheep production systems

Resumen:

El objetivo de este trabajo fue revisar la información acerca de la investigación sobre características de la canal y composición del tejido de la canal en ovinos de pelo en el sureste de México. La información disponible reveló que se han investigado los principales métodos, "medidas *in vivo*", como las medidas de ultrasonografía y las medidas biométricas; y "mediciones *post-mortem*" tales como disección de cortes primarios (cuello, hombro y sección de costillas 9-11) y mediciones de canales de razas ovinas de pelo criadas en el sureste de México.

Palabras Clave:

Composición de la canal, razas ovinas, sistemas de producción ovina

1. Introduction

Sheep production systems in the tropical areas of Mexico are characterised by the grazing of native and introduced pastures from low to medium quality, reduced supplementation, and the use of hair breeds, which are better adapted to harsh environments. Among those breeds, Pelibuey is the most utilised maternal breed under commercial conditions in Mexican tropic [1].

The tropical region in Mexico constitutes around 28 % of the national territory, and the sheep production systems in this area contribute 25 % of the national sheep meat production. These systems are managed under harsh environmental conditions. They are characterised by low inputs and low

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technology adoption, and by the use of the hair sheep population, mainly Pelibuey breed [2,3]. Adult females are kept on pasture with little or no supplementation, which generally results in seasonal fluctuations in energy intake and use of body reserves and, subsequently, low meat production [3]. In Mexico, many sheep sold for slaughter are discarded adult animals with poor body condition [3, 4, 5]. If producers want to avoid penalty rates when marketing these animals, ewes need to be housed to achieve better weight and body condition. Because there is demand for animals with a minimal amount of body fat for preparation of traditional dishes such as barbacoa [6]. It is important to know the carcass characteristics of adult ewes and thereby provide the producer a viable option for the sale and consumption of this type of meat animals [3]. In this sense, for more than 7 years, our research group has investigated alternative methods to total carcass dissection to determine the carcass tissue composition of hair sheep. Among the main methods, "in vivo measurements" have been investigated, such as ultrasonography measurements and biometric measurements; and "post-mortem measurements" such as dissection of primal cuts (neck, shoulder, and 9-11 rib section) and carcass measurements.

2. Carcass traits of hair sheep

In 2016, Ruiz Ramos et al. [3] evaluated the carcass and non-carcass components of adult Pelibuey ewes subjected to three levels of metabolizable energy intake (MEI); concluded that a high level of metabolizable energy intake improves commercial dressing percentage due to increased lean meat and fat deposition with a lower proportion of bone in the carcass of adult Pelibuey ewes. Therefore, short periods of feeding can increase body weight and improve body condition score of adult ewes in order to fetch a better market price. For that, further studies should focus on determining the optimum level of supplementation so that producers can obtain the greatest economic benefits. And identifying which carcass quality characteristics of cull animals should be improved in order to provide a quality product for human consumption.

Arce-Recinos et al. [7] reported that the carcass yields were unaffected in Pelibuey sheep classified by feed efficiency index (FEI) as residual feed intake (RFI) and residual intake and gain (RIG). It was observed that the area of the LT muscle was no different ($P > 0.05$) between the lambs grouped by RFI or by RIG. Likewise, the depth and width of the LT muscle did not differ ($P > 0.05$) between the animals classified by RFI or by RIG. Also, the subcutaneous fat thickness did not differ between the animals grouped by FEI evaluation. Despite these relationships, the improvement of efficiency for both traits did not affect carcass characteristics. However, the meat quality is lower in efficient lambs, since they had greater cooking loss. The high cooking loss in meat from low-RFI and high-RIG lambs seems to be related to a high content of water bonded to protein in the fresh meat.

Hair sheep breeds are important for meat production in tropical regions and characterising carcass tissue composition is vital to promote economic efficiency in these production systems. Escalante-Clemente et al. [8] and Sabbioni et al [9] stated that the conservation of biodiversity has become an important topic in animal husbandry, and the first step to determining the potential use of local breeds for production is to explore their relevant productive traits.

3. Methods to predict carcass tissue composition in hair sheep

3.1 Ultrasound measurements

In the same year, Aguilar-Hernandez et al. [5] evaluated the relationship of ultrasound measurements and carcass traits in Pelibuey ewes. They concluded that it is possible to predict the amount of muscle, fat and bones in the carcass of Pelibuey ewes, using measurements by ultrasound and the live weight of the animal. Nevertheless, other alternatives must be evaluated to increase the accuracy of these estimates. Also, more research is needed in assessing the ultrasound measurements (USM) and its potential for predicting body and carcass composition of hair sheep, in order to create predictive models of body and carcass composition of such sheep breeds. Chay-Canul et al. [10] concluded that it is possible to use the ultrasound measurements as a tool for carcass characteristics evaluation in discarded Pelibuey ewes. It is possible to predict the hot carcass weight and the protein and fat quantity in the carcass. In this way, a higher value will be able to be assigned to the ovine carcass, depending on yield and its attributes. Besides improving the body condition in animals next to slaughter to improve their meat quality and to achieve a greater position in the commercial scale. In this sense, Morales-Martinez et al. [11] concluded that the use of ultrasound measurements could accurately and precisely be used as alternatives to predict the internal fat depots of Pelibuey sheep. In particular, the measurement of kidney fat thickness

via ultrasound can be used to successfully predict the internal body fat depots in hair sheep (Figure 1).

Figure 1. Ultrasound measurements in hair sheep

3.2 Biometric measurements

Bautista-Diaz et al. [12] concluded that the Biometric measurements can be used to predict carcass characteristics of Pelibuey ewes with different body conditions. Prediction models found in the present study had r^2 that ranged from 0.49 to 0.93, indicating the good accuracy of these. However, the generated models should not be considered as general applications for animals from other races, sex and physiological conditions (growth, pregnancy, lactation) different, so more studies are needed in different production situations. Also, Bautista-Diaz et al. [13] found that the equations for predicting shrunk body weight (SBW), hot carcass weight (HCW), and cold carcass weight (CCW) using BMs had an r^2 ranging from 0.89 to 0.99, and those for predicting the weights of the total soft tissues and bone tissues had an r^2 ranging from 0.74 to 0.91 in hair sheep lambs. These authors concluded that the use of BMs could accurately and precisely be used as a useful and practical tool for predicting carcass characteristics of hair sheep lambs (Figure 2).

Figure 2. Biometric measurements in hair sheep.

3.3 Carcass cuts

Regarding prediction of carcass tissue composition, our research group has evaluated different approaches such as carcass cuts. Escalante-Clemente et al. [8] using the 9th–11th rib section to predict carcase tissue composition in Blackbelly sheep found that can be used as an alternative trait to predict carcase tissue composition in Blackbelly sheep as they can provide moderate (r^2 >0.59 and 0.92) and high accuracy (bias correction factor >0.96) predictions. The dissection of the 9th–11th rib section is a semi-invasive technique that allows to identify carcass traits in different ruminant's species (Figure 3). Results from the present study are specific to a hair sheep breed and predictive equations may not be extrapolated to other breeds, but this builds a starting point for studying other sheep breeds from tropical production systems.

Figure 3. The 9th–11th rib section.

Also, Rivera-Alegria et al. [14] evaluated the neck traits to predict of carcass characteristics in hair-sheep ewes, these authors found that the use of neck traits showed a positive relationship, being stronger for the hot and cold carcass weights with the neck traits, which turned out to be adequate predictor variables for the carcass muscle weight and fat. In this sense, the weight of the neck and its content of muscle and fat could be used to predict the composition of the carcass tissue in non-pregnant and non-lactating multiparous Pelibuey ewes. Recently, Gastelum-Delgado et al. [14] in a study designed to develop predictive equations estimating carcass tissue composition in growing Blackbelly male lambs using as predictor variables for tissue composition of wholesale cuts of low economic value (i.e., neck and shoulder). These authors found that the obtained models explained (p

< 0.01) 94, 92 and 88% of the variation observed for carcass muscle, fat and bone, respectively. The results showed that prediction of carcass composition from shoulder tissue composition is a viable option over the more accurate method of analysing the whole carcass (Figure 4).

3.4 Carcass measurements

Also, Gomez-Vazquez et al. [16] in attempt to predict the tissue carcass composition of “Blackbelly” lambs using *in vivo* and *postmortem* measurements found that the carcass tissues were correlated with *L. dorsi* muscle depth (p≤0.05; r-values ranged from 0.67 to 0.80) and carcass compactness index (p≤0.05; r ranged from 0.54 to 0.75). Additionally, the r2 for the prediction equations of the carcass tissue composition ranged from 0.71 to 0.78 for fat (p≤0.001). These authors concluded that the use of in vivo and postmortem measurements allowed the prediction of tissue carcass composition of lambs, with moderate to high accuracy (r2 >0.71≤ and ≤0.78).

Figure 4. Dissection shoulder in sheep

4 Conclusion

The available information revealed that the main methods, "*in vivo* measurements" have been investigated, such as ultrasonography measurements and biometric measurements; and "*post-mortem* measurements" such as dissection of primal cuts (neck, shoulder, and 9-11 rib section) and carcass measurements I hair sheep breeds raised in south-eastern Mexico.

Conflicto de intereses

Los autores declaran que no existe conflicto de intereses.

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