EATING QUALITY OF LAMB MEAT FROM THREE DIFFERENT BREED-TYPES RAISED IN BRAZIL

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Abstract – The aim of this work was to evaluate the quality of lamb meat from three different breed-types raised in Brazil: pure Santa Inês, and crossbreeds Santa Inês/Dorper and Santa Inês/Suffolk. Four animals of each breed-type were employed. Quality of *Biceps femoris* muscles was evaluated by means of physical-chemical (proximate composition, pH and shear force) and sensory parameters (affective acceptance test using 9-point hedonic scale). Statistical differences (P<0.05) were found in relation to moisture, protein and lipid content among samples, the crossbreed Santa Inês/Dorper showed the lowest moisture and the highest content of total lipids. There were no differences (P>0.05) for pH measures and sensory parameters for all the attributes tested among breeds. On the other hand, samples were different (P<0.05) for the shear force quality parameter, the breed Santa Inês/Dorper exhibited the highest tenderness. As the differences found for proximate composition and tenderness did not affect the acceptance by the panelists, it was not possible to assign one of the breeds studied as the best in relation to eating quality. In this sense, the choice by Santa Inês or the hybrids with Dorper or Suffolk could be defined in function of zootechnic parameters.

Key Words – *Biceps femoris*, sheep, Santa Inês.

I. INTRODUCTION

The Brazilian sheep-raising chain has been undergoing solid growth in recent years. However, although sheep-raising is present in several regions of the country, with a considerable number of rural producers, especially small ones, it is still not explored in an efficient and competitive manner at levels that ensure its profitability and the consequent generation of jobs and income in a sustainable and growing manner. The production and sale of sheep meat is still unorganized, resulting in an insufficient supply of the meat. Furthermore, most producers are still unaware of the importance and necessity of providing a standardized meat and with good quality throughout the year [1].

Considering this scenario, the demand for lamb meat can be expanded provided that a better organized chain is implemented with contribution of the producers. The international sheep meat market is mainly supplied by production in New Zealand and Australia. These countries have increased their production and invested in meat quality through the sheep species' genetic variability with the use of crossbreeding [2]. The main differences among breed types are related to carcass weight which is influenced by age maturity, weight gain and lipid deposition [3, 4]. In this sense, it is important to have better knowledge of the different sheep breed-types characteristics, not only in relation to animal husbandry performance, but also in relation to the meat quality of each breed or crossbreed.

Santa Inês breed lambs are very common in Brazil due to their good acclimatization in tropical regions, rusticity, fertility, and high offspring. Nevertheless, the low carcass weight leads to actions in genetic improvement by the crossing with other breeds such as Dorper and Suffolk animals, providing higher weight carcasses, better conformation and higher lipid deposition [5, 6]. Thus, breed or genotype is an important aspect to consider for developing the appropriate sensory quality (eating quality) in lamb [7].

Sensory properties of meat are directly related to its proximal composition, which is influenced by breed among other factors [8].

While meat color is the main attribute taken into account at the moment of purchase, meat tenderness will determine repurchase and is thus highly considered in sensory evaluation and consumer degree of satisfaction [9].

In face of the above, the objectives of this study were to determine and compare physical-chemical and sensory meat quality parameters from different breed-types of lamb that are economically important to Brazilian sheep raising, in order to verify the possible existence of differences in the breed-types meat eating quality, thus providing subsidies to guide producers in choosing the best breed-type to be raised.

II. MATERIALS AND METHODS

A. Meat packaging

Lamb *Biceps femoris* muscle from 12 animals, were employed for this study, four per breed-type (Santa Inês and crossbreeds Santa Inês/Dorper and Santa Inês/Suffolk), slaughtered between 5 to 6 months and live weight between 35 and 40 Kg. After 24 hours of slaughter, carcasses were deboned and samples were individually vacuum-packaged and stored at -18 ± 1 °C until further analysis, all performed in triplicate.

Eight samples were sectioned by breed-type, four of them being designed for the analysis of chemical composition, pH and shear force and four for the sensory analysis.

B. Proximate composition

To analyze the chemical composition of the samples, the official methodology [10] was used to measure moisture (950.46), fixed mineral residue (or ash) (920.153) and protein (981.10). The lipid content was determined using the extraction method [11].

C. pH values

The pH was measured using a pH meter (HANNA, HI 99163) with a combined electrode for performing readings in triplicate with perforation of the meat.

D. Shear force

The shear force was assessed according to the methodology described by Koohmaraie [12] with modifications. The samples were cooked in an electric oven at 180 °C until the internal (geometric center) temperature reached 72 °C. After cooking, the samples were cut individually and parallel to the muscle fibers into ten rhomboids measuring 2 x 1 x 1 cm. The shear forces of these cuts in kilograms were determined using a Warner Bratzler texturometer (Model 235 6X, Mark Salter Brecknell).

E. Sensory evaluation

For the sensory evaluation of lamb meat from different breed-types, affective acceptance tests were performed using a 9-point hedonic scale according to the methodology described by Meilgaard *et al.* [13].

Sixty consumers were recruited among students, teachers and employees of FZEA/USP in Pirassununga-São Paulo, where the selection criterion was just to like lamb meat. The recruited consumers were given a free and informed consent form to be read and signed prior to performing the tests.

The samples were cooked in a similar manner to that described for the evaluation of shear force and were stored in an oven at 60 °C for a maximum of 30 minutes. The samples were served individually to the participants, inside disposable plastic cups that were coded by three-digit numbers. A randomized complete block design was used, and the panelists assessed the attributes aroma, texture, juiciness, flavor and overall quality.

III. RESULTS AND DISCUSSION

Results of proximate composition were 76.70, 1.10, 2.03 and 17.74% (w/w) for moisture, total ash, total lipids and protein, respectively. These results were comparable to several scientific reports [14, 15], exception for protein, which content was below to available data in the literature (20 to 23%). Statistical differences ($P<0.05$) were found among the studied breeds for moisture and protein levels, where Santa Inês/Dorper showed the lowest moisture and protein contents and the highest value for total lipids.

In relation to pH it was not verified significant difference ($P>0.05$) among the studied breed-types, where samples showed values between 5.46 and 5.64. These results suggest a proper quality for consume and/or storage, considering that a meat of good quality shows a final pH around 5.40 to 5.70.

Shear force varied significantly among samples ($P<0.05$), where those from crossbreed Santa Inês/Dorper were more tender (3.75±0.17Kg) compared to Santa Inês (4.14±0.17Kg) and the crossbreed Santa Inês/Suffolk (6.22±0.17Kg) which exhibited the highest shear force values (less tender). Significant differences in instrumental tenderness among different sheep breed-types have been reported by other authors [2, 16]. Most of Warner Bratzler shear force values found in this study were comparable to those reported by other authors [17] for five different lamb breeds from the Marmara Region, in Turkey (between 3.66 and 5.05 Kg).

For sensory tests, among the selected participants, 58% were female and 75% were between 20 and 40 years old. Samples did not statistically differ ($P>0.05$) for none of the tested attributes (Table 1). In general, the average attributed scores were near to 7.0 ("liked moderately"), above the acceptance limit established in the study of 5 ("neither liked, nor disliked").

Considering the lowest value for shear force and the highest content of total lipids to samples from Santa Inês/Dorper, it would be expected a superior acceptance for this sample by the panelists, which did not occur.

Table 1 Acceptance test average scores for the three lamb breed-types

Breed-types	Sensory attributes				
	Aroma	Texture	Juiciness	Flavor	Overall Quality
	M[1]±SD[2]	M±SD	M±SD	M±SD	M±SD
SI[3]	6.2±0,2[a]	6.8±0,2[a]	7.1±0,2[a]	6.8±0,2[a]	6.7±0,2[a]
SI/D[4]	6.4±0,2[a]	6.9±0,2[a]	7.1±0,2[a]	7.0±0,2[a]	7.0±0,2[a]
SI/S[5]	6.4±0,2[a]	6.8±0,2[a]	7.1±0,2[a]	7.1±0,2[a]	6.9±0,2[a]

[1]Mean; [2]Standard Deviation; [3]Santa Inês; [4]Dorper; [5]Suffolk

IV. CONCLUSION

The physical and chemical parameters, moisture, protein, total lipids and shear force showed differences among the evaluated lamb breeds. However, these differences did not influence the sensorial acceptance of samples, which showed similar scores for all tested attributes by the panelists. According to the obtained data, it was not possible to assign which lamb breed-type provided the meat with best eating quality. It can be concluded that the choice for one of the studied breed-types should be defined according to zootechnic parameters.

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