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MORPHOMETRIC DIMENSIONS ALLOW DIFFERENTIATION OF LAMB CARCASSES FOR SOME BREEDS

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SUMMARY

Eight different morphometric dimensions were monitored on 106 lamb carcasses belonging to three Catalan meat sheep breeds (Ripollesa, Rousillon Red and Xisqueta). Our purpose was to examine differences with regard to measurable carcass dimensions and also to establish between and within breed relationships among the carcass components. Measured variables included: carcass weight (CW), leg length (LL), carcass internal length (IL), carcass length (CL), chest width (ChW), hip width (HW), chest depth (CD), leg circumference (LC) and chest circumference (CC). From these measurements seven indices were obtained. Roussillon Red carcasses were the shortest, with the largest leg capacity, the lowest corporal index and giving a sense of "squareness". Xisqueta carcasses presented the longest leg length. Ripollesa carcasses were the smallest in chest circumference. The rest of the variables were similar between breeds.

***KEY WORDS*:** abattoir, morphostructure, Ripollesa, Roussillon Red, Xisqueta

INTRODUCTION

Carcass value is obviously very important, and must be related to the possibility of developing and applying new valuation systems. The growing volume of transactions in the European Union and more demanding markets are reasons that justify the use of these systems. Production of animals' meat involves growth, development and assessment of conformation, so any attempt to measure morphometric carcass parameters in ways other than conventional weighing and grading seems appropriate. Body measurements in addition to weight measurements describe a carcass more completely than those conventional methods. Carcass metric measurements and indices estimated from various combinations of conventional carcass values not only can provide a superior guide to estimate weight but can also be used as indicators of carcass conformation. Moreover, they can be considered as morphologic characters that can provide comprehensive information to complete investigations on the performance of Spanish sheep breeds.

In this light, this investigation was designed to analyse and compare the carcass metric parameters of lambs (3-4 months) of Catalan breeds in their own right, aside from their commonly reported relationship to carcass weight. One objective was to show the importance of breed for carcass conformation. Another objective of the study was to evaluate the explanatory ability of the studied morphometric – and thus objective – characteristics of the lamb carcass with regard to its conformation.

The studied breeds are meat-producer breeds of Catalonia (NE Spain) and represent standardized populations in Spain (Xisqueta and Ripollesa) or France (Rousillon Red). Lauvergne, (1988) defined standardized populations as groups of animals with a very uniform external appearance and a well-defined racial standard. The Ripollesa sheep breed, the most abundant native sheep breed in Catalonia, is composed of medium-sized animals which originated from centuries of crossbreeding of native sheep populations – formerly present in the Central Pyrenees– with transhumance animals belonging to the Merina sheep breed that used to reach this region in summer. At present it is distributed mainly in the NE regions of Catalonia (Milán *et al*., 2003). They occupy an extensive geographic range with

diverse orographic and agricultural characteristics such as mountain woods and valleys and interior cultivated plains, as well as woods and cultivated lands close to the coast. It is a very rustic breed.

The Xisqueta sheep, known for its longevity, is a descendant of primitive sheep that arrived from Central Asia (Jordana & Ribó, 1991). They have low internal variability and are close to the ancestral model; in fact, these breeds show few morphological differences among themselves. These populations are mainly located in highland areas such as the Iberian System (Ojalada sheep), the Penibetic System (Montesina sheep) and the Pyrenees (Xisqueta sheep) and are commonly known as *Serrana* breeds. The original nucleus of the Xisqueta is situated in the N of the Pallars Jussà region but the breed expanded towards the high Catalan Pyrenees, central regions of Lleida and close areas of Huesca. However, the progressive decline of the breed since the middle of the XXth century has caused a gradual reduction in its geographic distribution range (Avellanet, 2002).

The Roussillon Red, also known as *Berberina* and *Rouge du Littoral*, takes the place name of the region where they originated, in Roussillon (France) (Babo, 2002), but nowadays they are spread in some parts of the Aude and Hérault areas of France and on the Spanish slopes of the Pyrenees too (Parés, 2007). It is a particular type of sheep, special because of its colour and origin, something between local "Merino"- type sheep and North African red breeds. All three breeds are examples of southern European breeds with semi-intensive management and moderate body weight at slaughter (20 to 25 kg).

The other Catalan breed is the Aranese, which is locally restricted to the Aran Valley, in the N Pyrenean region of Catalonia; it has not been studied in this research as carcasses are rarely produced outside its area of origin.

MATERIAL AND METHODS

The data for this study was generated from 106 lambs belonging to 3 Catalan meat breeds; Ripollesa (N=21), Roussillon Red (N=50) and Xisqueta (N=35). Lambs were managed in different mixed flocks in the Occidental Pyrenees and transported to an abattoir for slaughter (short road trips < 4 h). The studied lambs were generally weaned at approximately 15 kg of body weight (BW) and at 30 to 45 days of age, and fed commercial concentrate and barley straw *ad libitum*. Slaughter was usually done when lambs reached a BW of 20 to 25 kg (90 to 120 days). The animals measured for this investigation belonged to different farmers.

After slaughter and evisceration, nine different body measurements were taken on each carcass. These included: leg length (LLe), carcass internal length (ILe), carcass length (CLe), chest width (CWi), hip width (HWi), chest depth (CDe), leg circumference (LCi) and chest circumference (CCi). Carcass weight (CWe) before cooling was also obtained (table 1). Seven indices were also obtained (table 2). The selection of these characteristics was made based on review of the literature, the butchers' opinion and the results of previous analyses.

Table 1. Body measurements taken on each carcass.

1	Leg length[1]	LLe
2	Carcass internal length[2]	ILe
3	Carcass length[3]	CLe
4	Chest width	CWi
5	Hip width	HWi
6	Chest depth	CDe
7	Leg circumference	LCi
8	Chest circumference	CCi

1: from tarsal joint to pubic symphysis
2: from pubic symphysis to first rib (cranial face)
3: LLe + ILe

Statistical analysis: Univariate descriptive (mean and standard deviation), Shapiro-Wilk, Levene and one-way ANOVA tests were performed in a single step using the PAST - "Paleontological Statistics Software Package for Education and Data Analysis" statistical package (Hammer *et al.*, 2001). No gender distinctions were made.

Animal Care and Use Committee approval was not necessary for this study because the data were obtained from animals slaughtered for commercial purposes. Slaughtering process was done according to EU Regulation 1099/2009 on the protection of animals at the time of killing.

Table 2. Obtained indices.

1^	Carcass Relative Weight	CRWe	(CWe/CLe) x 100
2^	Leg Compacity Index	LCoI	(LCi/LLe) x 100
3^	Chest Index	CheI	(CWi/CDe) x 100
4^	Carcass Width Slope[1]	CWiS	(HWi/CWi) x 100
5^	Carcass Corporal Index	CorI	(CLe/Ci) x 100
6^	Carcass Weight Index[1]	WeiI	(CLe x CCi) x [(HWi+CWi/2)]
7^	Leg Length Index	LLeI	(LLe/HWi) x 100

1: based on Salako (2006)

RESULTS AND DISCUSSION

Results of the analysis are presented in table 3. It appears that Roussillon Red carcasses are the shortest, with the lowest corporal index (explained by their shortness). Their chest is more wide than high, giving a sense of "squareness". Xisqueta carcasses present the longest leg length (this is the breed most adapted to long journeys, because of transhumance, which is still practiced today), with an internal length similar to those of Ripollesa and Roussillon Red. Ripollesa carcasses are the smallest in their chest circumference. The leg capacity is largest in Roussillon Red carcasses (with the leg zone being the most commercially appreciated in Catalan markets). The rest of the variables were similar between breeds, except for hip width, leg circumference and one index (Leg Length Index) that did not appear to be normally distributed.

In general, the research confirms the intuitive observations of Catalan butchers: Roussillon Red carcasses are more "compact", while Xisqueta carcasses are more "leggy" and thus depreciated in their commercial class value.

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Table 3. Results of the univariate descriptive analysis (Mean±Standard deviation) and homoscedasticity tests (Shapiro-Wilk and Levene). Measurements in cm (linear) or in kg (weight)

	Ripollesa (N=21)	Roussillon Red (N=50)	Xisqueta (N=35)	Sig.	W	Levene
LLe	41.5±1.37 a	40.6±1.73 a	42.7±2.07 b	**	**	**
Ile	52.0±2.19 a	50.1±2.55 b	51.7±2.40 ab	**	**	**
CLe	93.4±2.41 a	90.7±3.80 b	94.3±3.92 a	**	**	**
CCi	63.4±2.41 a	65.7±3.06 b	65.2±2.99 b	*	**	**
LCi	34.6±3.18	35.8±3.64	34.9±3.93		N.S.	**
CWe	13.8±1.49 a	13.4±1.71 a	13.9±1.86 a	N.S.	**	**
CWi	18.8±1.99 a	19.6±1.40 a	18.7±1.64 a	N.S	**	**
CDe	23.2±0.83 ab	22.7±1.15 b	23.6±1.33 a	*	**	**
HWi	17.6±1.59	18.1±1.76	17.3±1.75		N.S.	**
CRWe	14.1±1.31	15.0±1.79	14.4±1.48	N.S.	**	**
LCoI	86.1±3.93 a	89.9±5.34 b	84.0±5.66 a	**	**	**
CheI	81.3±8.78 a	86.5±6.23 b	79.2±6.39 a	**	**	**
CWiS	94.3±7.05 a	92.8±9.81 a	93.3±9.76 a	N.S.	**	**
CorI	146.6±5.65 a	138.4±6.65 b	145.2±4.22 a	**	**	**
WeI	26.9±2.09 a	25.8±1.67 a	26.3±2.11 a	N.S.	**	**
LLeI	236.9±17.00	230.1±19.52	247.9±27.61		N.S.	**

(a,b,c) Different letters in the same row differ significantly (Sig.)
W: Shapiro-Wilk significance
* P<0.05 ** P<0.001 N.S. Not Significant