CARCASS QUALITY FROM GALICIAN LAMBS RAISED UNDER AN EXTENSIVE PRODUCTION SYSTEM: EFECT OF LIVE WEIGHT

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***Abstract*-The purpose of this study was to determine the carcass quality characteristic (carcass morphology and carcass commercial cuts) from Galician lambs. Thirty suckling lambs were used in this experiment. The effect of live weight at slaughtered (LW of 12-13, 15-16 and 19-20 kg) was investigated. To study carcass morphology and cuts, dissection and measurement of the left half-carcass was carried out. LW affected carcass measurements except pelvic limb length, carcass cuts, carcass cold weight (P<0,001) and carcass hot weight (P<0,001), chilling losses and killing out.**

Index Terms- Extensive production system, Carcass cuts, Carcass measurements, Carcass characteristics, Live weight effect.

I. INTRODUCTION

In the last years, there is a tendency toward the extensive production due to the change of the consumers' demand toward a product of better quality. However the changes of production systems involve a change in the characteristics of the product (Chetnutt, 1994; Díaz et al., 2002) that can affect to their acceptance in the market. The degree of fatness (Murphy, T.A., Loerch, S.C., McClure, K.E. and Salomon, M.B., 1994), colour of the covering fat and meat colour (Priolo, A., Micol, D., Agabriel, J., Prache, S. and Dransfield, E., 2002) can be influenced by the feeding system and depend on the composition and of the quantity of grass ingested in the diet.
The meat from light lambs is considered to be of better quality (more tender and less intense flavour) than meat from heavier animals and also there are important differences of price between carcasses (Sañudo, C., Sánchez, A. and Alfonso, A., 1998).
Practically all carcass classification systems around the world include a fatness score, age, sex, weight, carcass length, meat colour and conformation score as a criterion of quality and price (Sañudo, C., Alfonso, M., Sánchez, A., Delfa, R. and Teixeira, A., 2000).
On the other hand, there is a lack of information about the quality of carcass and meat from Galician lambs. In fact, this study is a part of a project aiming to determine animal growth, carcass and meat quality characteristics in two production systems (intensive and extensive conditions).
Therefore, the aim of this work was to determine the effect of live weight (LW) on carcass quality from Galician lambs raised under an extensive production system.

II. MATERIAL AND METHODS

Thirty lambs (15 males and 15 females) from a flock of COVIGA (agricultural cooperative of ovine breed) were used for this study. Animals were separated into three groups of ten animals (5 males and 5 females) and slaughtered at different live weights (LW) with LW in the next range, 12-13 kg (LW_1), 15-16 (LW_2) and 19-20 (LW_3). The

lambs were kept with dams and were raised on maternal milk and pasture "*ad libitum*" from birth to slaughter desired. All lambs were weighted at birth, one time a week throughout the experimental period and at slaughtered. Animals were conventionally slaughtered at a commercial abattoir and carcasses were weighted (hot carcasses weight, HCW). pH also was measured at slaughtered moment (pH_0) and after 45 minutes (pH_{45}). At this point carcasses were moved to research centre pilot plant and were chilled at 4°C in a cold chamber for 24 h. Cold carcasses weight (CCW) and pH (pH_{24}) were recorded. Chilling losses were estimated as the difference between HCW and CCW relative to HCW and expressed in percentage. The killing out percentage was calculated as the CCW expressed as a proportion of the slaughter weight. Dissection of the left half-carcass was carried out according to the methodology described by Colomer-Rocher, F., Delfa, R. and Sierra, I. (1988) and five joints were obtained: pelvic limb, thoracic limb, loin, neck and tail. The following carcass measurements described by Colomer-Rocher, F., Delfa, R. and Sierra, I. (1988) were determined to assess carcass morphology: Chest width, Chest perimeter, Thorax width, Carcass internal length, Thorax perimeter, Pelvic limb length.

For the statistical analysis of the results, data were analyzed using the SPSS (version 15.0, USA). An analysis of variance (ANOVA) using the general lineal model (GLM) procedure was carried out. The least squares mean (LSM) were separated using Duncan's t-test. All statistical test of LSM were performed for a significance level <0.05.

III. RESULT AND DISCUSSION

The effect of LW at slaughtered on carcass characteristic, carcass cuts and carcass morphology are given in table 1. Carcass weight were improved significantly with a longer LW of the animal ($P<0,001$). In a previous report García-Fontán, M.C., Lorenzo, J.M., Rodríguez, E.M. and Franco, D. (2009) found lower values in meat lamb under intensive production system and values of HCW and CCW were lesser. Chilling losses and killing out were significant affected by live weight ($P<0.01$ and $P<0.05$, respectively). Animals on concentrate-based diets have higher average daily gains then those on pasture and thus, animals slaughtered at constant age have different weights and those slaughtered at constant weight have differents ages. In this situation it is difficult to discriminate between the direct effects of the diet components on carcass and meat characteristics and the indirect effects caused by differences in growth rate (Priolo, A., Micol, D., Agabriel, J., Prache, S. and Dransfield, E., 2002).

Fatness level were not significant ($P\geq0.05$) and were less to those found by García-Fontán, M.C., Lorenzo, J.M., Rodríguez, E.M. and Franco, D. (2009). This result was expected due to production system could be affect fatness carcass score (Chesnutt, 1994). These authors (Murphy, T.A., Loerch, S.C., McClure, K.E. and Salomon, M.B., 1994; Santos-Silva, J., Bessa, R.J.B. and Santos Silva, F., 2002). found that lamb carcass from extensive system were lesser fatness. Mean pH values ranged between 7.00 and 6.89 at 0 minutes *postmorten* and between 5.95 and 5.81 at 24 hours *postmorten*. The effects of LW on meat pH levels at pH at 0, 45 minutes and 24 hour *posmorten* were not significant ($P\geq0.05$). These results are higher than observed by Ripoll, G., Joy, M., Muñoz, F. and Albertí, P. (2008) for a similar production system.

With regard to linear carcass measurements and carcass cuts, they are used as indicators of carcass conformation and size and the results of the current study indicate significant effect ($P<0.05$, $P<0.01$ and $P<0.001$) of LW on carcass measurements and carcass cuts with the exception of pelvic limb length. This results was expected because several authors reported an increase in carcass measurements and conformation indexes parallel

to increasing carcass weight (Díaz, et al., 2002; Revilla, I., García-Martín, M.A: and Vivar-Quintana, A.M., 2005; Luaces, M.L., Calvo, C., Fernández, A., Viana, J.L., Fernández, B. and Sánchez, L., 2007; Santos, V. A. C., Silva, S. R., Mena, E. G. and Azevedo, J. M. T., 2007).

Table 1. Age, carcass weight, EUROP conformation, fatness scores, other carcass characteristics and carcass cuts and morphology from different live weight at slaughtered.

	Slaughtered Weight (kg)			Significance	SEM
	LW_1 (n=10)	LW_2 (n=10)	LW_3 (n=10)		
Carcass characteristic					
HCW (kg)	7.26±0.77[a]	8.12±0.80[b]	9.27±0.83[c]	***	0.21
CCW (kg)	6.91±0.78[a]	7.81±0.80[b]	9.08±0.81[c]	***	0.22
Chilling losses (%)	4.85±1.36[a]	3.76±1.72[b]	1.99±1.18[b]	**	0.34
pH_0	6.88±0.21	7.00±0.33	6.89±0.28	n.s.	0.05
pH_{45}	6.60±0.19	6.64±0.32	6.60±0.24	n.s.	0.04
pH_{24}	5.81±0.31	5.95±0.28	5.93±0.14	n.s.	0.05
Conformation	2.70±0.67	3.00±0.50	3.30±0.67	n.s.	0.12
Fatness level	1.40±0.51	1.55±0.88	1.40±0.70	n.s.	0.12
Killing out (%)	54.26±5.29[a]	50.78±5.17[ab]	47.82±3.36[b]	*	0.97
Carcass cuts					
Pelvic limb	0.95±0.10[a]	1.11±0.07[b]	1.26±0.14[c]	***	0.03
Thoracic limb	0.37±0.09[a]	0.41±0.05[a]	0.58±0.07[b]	***	0.22
Loin	0.55±0.07[a]	0.63±0.06[b]	0.71±0.05[c]	***	0.02
Neck	0.22±0.02[a]	0.29±0.05[b]	0.29±0.05[b]	**	0.01
Tail	0.05±0.01[a]	0.07±0.01[b]	0.08±0.02[b]	**	0.01
Carcass measurements					
Pelvis width	11.33±0.87[a]	11.46±0.56[a]	12.15±0.58[b]	*	0.14
Leg perimeter	27.71±1.89[a]	29.55±1.23[ab]	30.22±2.65[b]	*	0.41
Chest width	9.48±0.69[a]	10.93±0.78[b]	10.91±1.00[b]	**	0.20
Half-carcass length	60.70±1.18[a]	64.15±1.91[b]	67.48±2.25[c]	***	0.62
Chest depth	13.43±1.31[a]	14.55±1.36[b]	16.19±0.64[c]	***	0.30
Pelvic limb length	29.19±1.43	29.87±1.71	30.67±1.60	n.s.	0.31

Significance: *** ($p<0.001$), ** ($p<0.01$), * ($p<0.05$), n.s. (not significant). Conformation: P=1, O=2, R=3, U=4, E=5; Fatness scale 1 to 5. Different letter after the mean value within the same row indicates significant differences ($P<0.05$) between ageing time.

IV. CONCLUSIONS

Carcass quality characteristics were significantly influenced by live weigh at slaughtered. Livestock production system under pasture management could be an interest alternative to current production system and can be used for reducing the feed cost of the breeding flock.

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