INFLUENCE OF LIVESTOCK SYSTEM ON CARCASS QUALITY OF GROWING "CHURRA TENSINA-BREED" LAMBS

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SUMMARY

The objective was to study the influence of livestock production system, extensive *vs.* intensive, on light carcass quality of Churra Tensina breed lambs. In the extensive system, 18 lambs were reared with their ewes on pasture from 7 days old to slaughter, with no supplementation feed. The intensive system, 18 lambs were kept indoor with free access to concentrate, while their ewes were also indoor from 17 h to 8 h, receiving 500 g of barley as concentrate and the rest of time had access to a pasture. At 50 days old, lambs from intensive treatment were weaned. When lambs had a liveweight of 22-24 kg were slaughtered and the carcass weight range was between 8.7 and 12.4 kg. At 24 h post-mortem, carcass classification, conformation and fatness degree were carried out following the Community Scale for Classification of Carcasses of light lambs (Regulation ECC 2137/92; 461/93). The pH and colour values (by spectrophotometer) of meat were recorded at lumbar area of *longissimus thoracis*. Colour of fat was recorded at the subcutaneous-caudal and perirenal fats at 24 h post-mortem. Results showed that carcasses from intensive treatment were better classified than the extensive mainly as a consequence of the greater fatness degree ($P<0.001$). Treatment did not affect the pH values. The little and inconsistent differences on muscle or fat colour between treatments has not any commercial implications, although consumers could not appreciate differences.

KEY WORDS: production system, lambs, carcass.

INTRODUCTION

The interest to study the forage-based production systems in growing lambs, similar to biological production, is a consequence to the increase of demand of traditional, healthy and safety meat products (Cocoran et al,.2001). However, this production system can be associated to a poorer growing performance and a changes of carcass and meat quality (Blackburn et al., 1991), which can not be desired for farmer nor for consumers. When forage is included in the fattening diet, in comparison to the drylot systems, it is observed a reduction of average daily gain (McClure et al., 1995), although the effect not always is significantly (Zervas et al., 1999), and carcasses had a lower degree of fatness. Nowadays, these lean carcasses (McClure et al., 1995, Ely et al., 1979, Murphy et al., 1994) can meet the desires of consumers, with more muscle and less fat depots, but with the traditional meat taste. At economical term, the forage-based production can present a reduction on total cost than dry lot, and the profitability of the system will depend mainly on the price of meat (Fernández y Woodward, 1999) owing its sensorial quality.

MATERIAL AND METHODS

A total of 36 Churra-Tensina ewes were used to study the effect of livestock production system on performance of growing lambs. Ewes were selected from the flock of the Animal Production Department of Centro de Investigación y Tecnología Agroalimentaria of Aragón (Spain), located at Bescós de la Garcipollera (Huesca's

Pyrenees). The ewes had a liveweight of 48.9 ±5.44 kg and had single male lambs. After lambing, they were divided into two treatments; each of them was uniform for lambing date and weight and had 18 ewes and its male lambs.
Two treatments were studied. One of them was conducted on mountain "meadow" (extensive) (E) and the other was conducted in a drylot (intensive) (I). In the P treatment ewes and lambs remained together from birth to slaughtering at the mountain pasture and did not have any kind of supplement. The other treatment, I, lambs remained always indoor and ewes went at pasture from 8 to 17 h everyday, and the rest of time ewes kept with their lambs to milk them. In this treatment, ewes were supplemented with 500 g/day of barley meal (11.85 %PB) and lambs had access to concentrate ad libitum: from birth to 33 days of age was a growing-concentrate (18.23% CP) and from 34 days to slaughtering was a fattening-concentrate (16.72% CP). The lambs from I treatment were weaned at an average age of 52±5 days.
Animals grazed a meadow of 1.13 ha and composed by 22% of leguminous (mainly *Trifolium repens*), 68 % of grasses (the main species were *Festuca arrundinácea* and *pratensis*, *Datylis glomerata*) and 10% of others species (*Rumex acetosa*, *Ranunculus bulbosus*...) The surface of the meadow was divided into two parts: one for E treatment and the other for the ewes of I treatment. The forage production of this meadow was always enough to assure the maxim intake by animals (Joy et al., 2004).
When lambs reached 22-24 kg of liveweight (LW) were separated and prepared to slaughter at the abattoir of Research Institute in Zaragoza, which is located at 180 km far away from Garcipollera (mountain farm). Lambs were weighted before their were carried out to Research Institute in Zaragoza. When they arrived were weighed again and accommodated according to the treatment to which belonged. They were grouped by treatment: I lambs received the same concentrate of the experimental period and E lambs had fresh forage although in this case animals had more stress because lambs were separated from their ewes. The slaughtering was done according to UE laws. At 24h post-mortem, carcass classification, conformation and fatness degree were carried out following the Community Scale for "Classifications of Lamb Carcass and Carcasses of Light Lambs (Regulation ECC 2137/92; 461/93)". Meat and fat colour values were determinate using a Minolta 2002 spectrophotometer in the CIELAB space (lightness, L*; redness, a* yellowness , b* (CIE, 1976). Hue (H*) was calculated from the a* and b* values according to Wyszecki and Stiles (1982). A 3 cm thick chop located in the 11-12th ribs of the longissimus thoracis (LT) was cut and placed in a polystyrene tray, covered with plastic film permeable to O_2 and stored at 4º C before measuring at immediately after cutting (1 d), 4 d and 7 d after slaughter.
At 24 h after slaughter the caudal and perirrenal fat colour were measured. Muscle pH measurements were done at the lateral of longissimus lumborum (LL) 4th rib at 24 h post mortem (pHu) using a penetrating glass electrode model Crisson.

All results were analysed by Univariate analysis by the GLM procedure of SAS (1999). The model followed was $Y_{ij} = \mu + \tau_i + \xi_j$.

RESULTS AND DISCUSSION

The carcass classification is showed in Figure 1. Carcass of E treatment had been classified between P+ (11,1 %) and R (22,2 %), with a general classification of O. The I treatment were classified between O- (5,2 %) and R+ (15,8 %), although most of them were situated in R- (31,6 %) and R (26,3 %), being the average of treatment R-, which is significantly better ($P<0.01$) than the carcasses from E treatment. That results

are in agreement with the studies that concluding that extensive livestock system without supplementation had a poorer conformation than that growth with a diet based on concentrate.

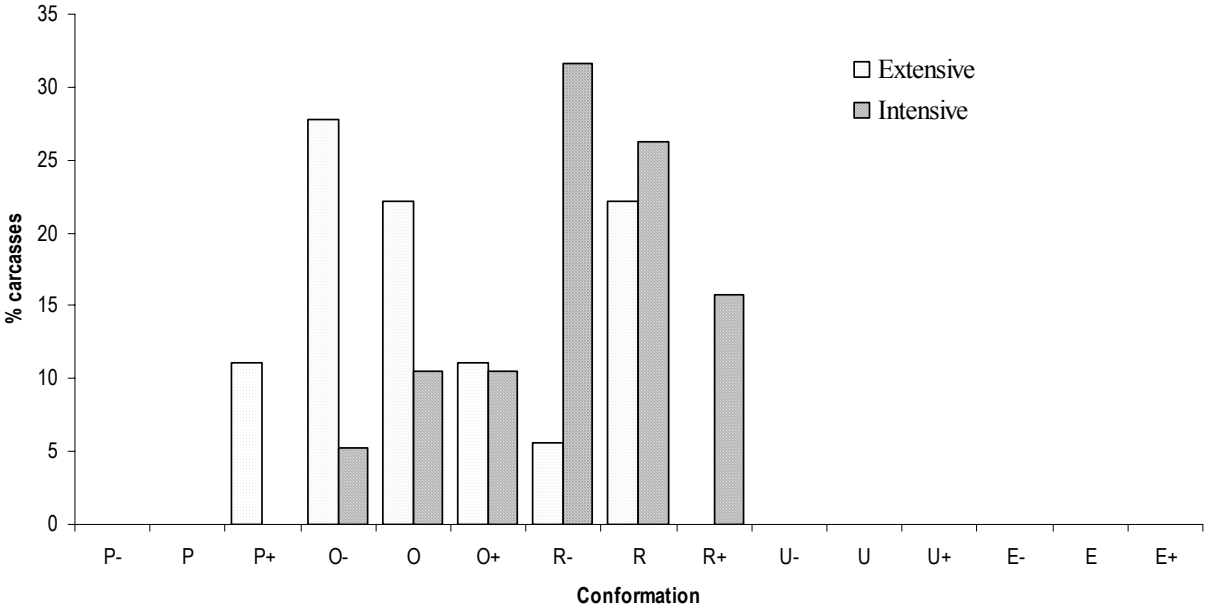

Figure 1. Carcass conformation (as a percentage) of Churro Tensina lambs growth under two livestock systems (extensive and intensive), and classified according to UE (RE 2137/92 y RE 461/93).

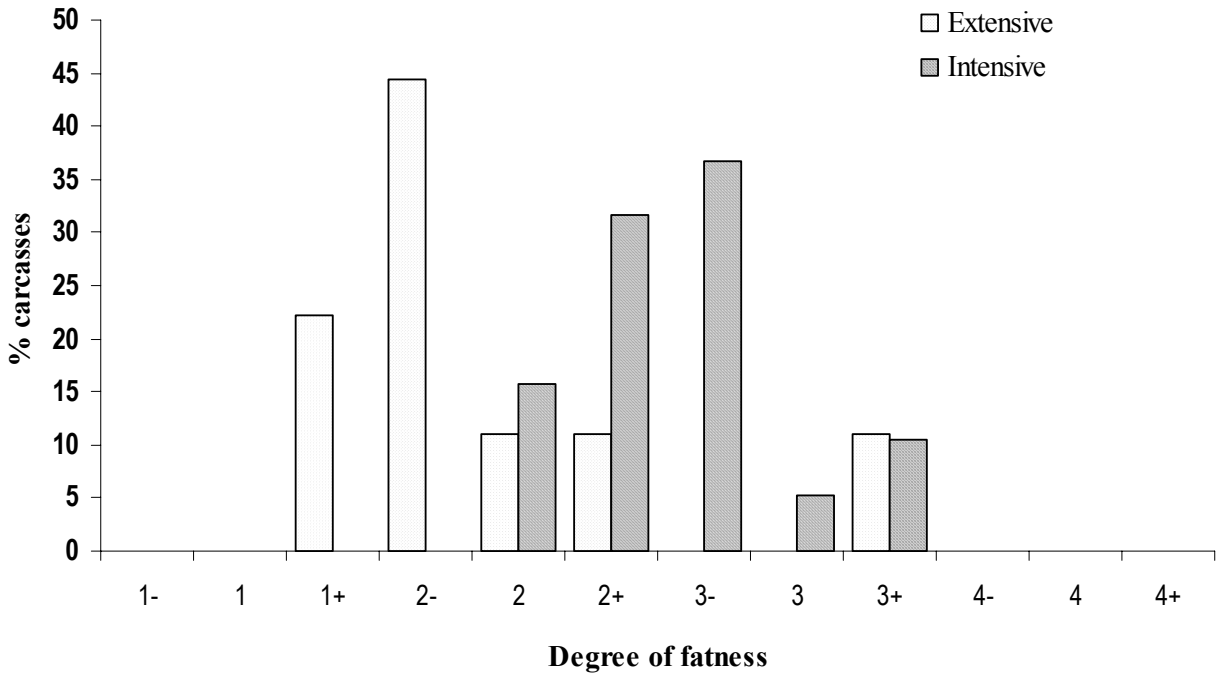

Figure 2. Degree of fatness (as a percentage) of carcasses of Churro Tensina lambs growth under two livestock systems (extensive and intensive), and classified according to UE (RE 2137/92 y RE 461/93).

The degree of fatness of extensive carcasses was lower than those from intensive ($P<0.001$) (Figure 2). Carcasses from E treatment were classified between 1+ (22.2%) and 3+ (11.1%), having most of them a degree of 2 (44.4%). The other treatment presented a degree of fatness higher, between 2 and 3+, being most carcasses in 2+ (31.6%) and 3- (36.8%). The lack of fat in the extensive carcasses was due to the diet, which was milk and forage without concentrate, therefore a low energy diet. Although the Spanish consumers like lean carcasses, the more appreciate category is between 2+ and 3-.

The pHu values of LL were 5.64 and 5.65 for E and I treatment, respectively, these values are on the ranges of expected pHu for these *Ternasco* commercial category (Sañudo et al., 1992; Sañudo et al., 1997).
The meat colour determinate at the lumbar area at 1, 4 and 7 days post-mortem are showed in the Table 1. At the moment of cutting the meat colour of intensive fed lambs was more lighter, had lower a* index and higher H* than meat of the extensive system. The rest of measurements at 4 and 7 d did not show any significant differences except for L* at 4 days post-mortem ($P<0.05$). The fat colour is show in Table 2. The subcutaneous fat measured at the caudal region the extensive carcass presented significantly higher b* index than intensive ones. However, these differences do not were confirmed by the others attributes as hue or lightness. In the same way, the perirrenal fat of extensive lambs had higher a* and b* index, yellowness was significantly higher ($P>0.001$) in carcasses of E treatment than those from I, but not significant differences were founded on lightness or hue between management systems.

Table 1. The pHu and colour of muscle *longissimus lumborum* at cutting time (1 d), 4 days, and 7 days post-mortem.

		EXTENSIVE	INTENSIVE	s.e.	Sig.
pHu		5.64	5.65	0.025	ns
1 day	L*	38.8^{b}	42.0^{a}	0.55	***
	a*	10.6^{a}	9.4^{b}	0.28	*
	b*	10.1	10.4	0.25	ns
	H*	43.5^{b}	47.9^{a}	0.90	**
4 days	L*	44.1^{b}	46.1^{a}	0.45	*
	a*	12.3	11.7	0.32	ns
	b*	14.7	14.6	0.25	ns
	H*	50.3	51.5	0.64	ns
7 days	L*	43.3	44.7	0.46	ns
	a*	12.0	11.5	0.27	ns
	b*	14.7	14.4	0.30	ns
	H*	50.7	51.4	0.64	ns

The Livestock system had a weak effect on muscle or fat colour.
Intensive fed lambs vs. extensive produced carcass better conformed, with a higher fatness. The extensive lambs presented no differences on instrumental measurements since the little and inconsistent differences in colour of fat and meat had not any commercial interest and consumer could nor distinguish between both treatments.

Table 2: The fat colour at 24 h post-mortem determinate at caudal and perirenal area of carcasses of Churro-Tensina lambs growth under two livestock systems (extensive and intensive)

		EXTENSIVE	INTENSIVE	s.e..	Sig.
Caudal	L*	76.1	76.6	0.83	ns
	a*	2.0	1.5	0.28	ns
	b*	17.2^{a}	13.3^{b}	0.61	***
	H*	83.5	83.9	0.93	ns
Perirenal	L*	74.1	75.8	0.99	ns
	a*	4.4^{a}	3.2^{b}	0.30	*
	b*	16.4^{a}	11.4^{b}	0.43	***
	H*	75.4	74.7	0.94	ns

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