

Effects of feeding system on carcass and non-carcass composition of Churra Tensina light lambs

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Abstract

Thirty-eight single male lambs (3.6 ± 0.08 kg live weight at birth) were used to study the influence of feeding system on carcass and non-carcass composition of Churra Tensina light lambs. Treatments: *indoor* (IND), lambs housed indoors consuming concentrate *ad libitum* until weaning at 53 days of age, and ewes grazing 8 h a day without their offspring and receiving a supplement of barley meal after grazing; *grazing* (GR), ewes and lambs grazed continuously without concentrate and lambs were unweaned. When lambs reached 22–24 kg live weight they were slaughtered. Carcass and non-carcass composition was recorded. GR lambs displayed higher carcass shrink ($P < 0.05$) and lower dressing percentage ($P < 0.01$) than concentrate-fed lambs. IND lambs had more body fat mainly due to the heavier kidney ($P < 0.001$) and subcutaneous ($P < 0.001$) fat depots. Total non-carcass weight was not affected by treatment ($P > 0.05$), but red organ (heart, lung and trachea, thymus, liver, spleen, kidney, diaphragm, pancreas, gall bladder, bladder, and testicles and penis), digestive tract (stomach, small intestine and large intestine) and head, skin, and feet (HSF) weights differed between treatments ($P < 0.05$). IND lambs had heavier red organs and HSF ($P < 0.05$) although this difference disappeared when expressed as a percentage of empty body weight. Small intestine weight in grazing lambs was heavier ($P < 0.001$) and, consequently, the total digestive tract differed similarly ($P < 0.01$). Treatment influenced the weights ($P < 0.05$) of all joints except leg ($P > 0.05$), showing heavier joints for IND carcasses. The feeding system had a greater effect on subcutaneous fat ($P < 0.001$) than on intermuscular fat ($P < 0.05$) in most of the standardized joints. IND carcasses produced a greater proportion of muscle/bone in all joints, except neck, whereas GR produced a greater proportion of muscle/total fat due to the lower amount of fat recorded in this treatment. The percentage of fatty acids was not affected by treatment ($P > 0.05$) although the percentage of C18:3 was greater and the ratio of C18:2/C18:3 was lower in grazing-fed lambs. The absence of any effect of treatment on the fatty acid percentages may be influenced by the short raising period and by the similar amount of intramuscular fat in both treatments. It is concluded that light lambs reared under grazing conditions can produce carcasses of acceptable quality, due to the lower percentage of subcutaneous fat, but with a similar intramuscular fat content.

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1. Introduction

The Churra Tensina sheep is an endangered, local coarse woolled hardy breed (around 4000 head) belonging to Churra group, which is raised for lamb production in the mountain area of southern Pyrenees. Lambs of

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this breed can be raised with dams until slaughter on permanent mountain pastures during spring, with slight penalties on their performance when compared with their concentrate-fed counterparts (Joy et al., 2004; Álvarez-Rodríguez et al., 2007). In a previous report, it has been observed that the carcass conformation score and fatness degree were lower in pasture-fed than in concentrate-fed lambs, according to the subjective classification scale of the EU, but barely undetectable differences were found in meat and fat colour when assessed subjectively and using a spectrophotometer (Joy et al., 2008).

However, little knowledge is available regarding objective carcass and non-carcass characteristics in extensive production systems of light lambs in comparison with the indoor production system, which is the traditional management system in Spain. Lambs are fed on a concentrate-based diet plus milk until weaning (45–50 days old) and thereafter are fed only concentrate until slaughter at light live weights (18–24 kg), normally earlier than 90 days (the ‘Ternasco’ commercial category).

The carcass quality of lambs reared on pasture is regarded as being superior by consumers and could be physically, biologically and economically sustainable (Zervas et al., 1999). The increasing demand for healthy, safe meat products (Corcoran et al., 2001) is stimulating market interest in extensive systems (Gil et al., 2000). Forage-based sheep production systems are more economical in comparison to indoors systems (Woodward and Fernández, 1999). It follows that grazing is an important part of a sustainable production system that keeps local sheep breeds such as Churra Tensina.

Depending on the cultural context, the non-carcass components (offals) may be considered as waste material that is thrown away, or as delicacies that have commanded a high price in the past couple of years. In fact, in most of countries the favourite dishes chosen by chefs to cook and to eat are offals (Consensus, 2007). Non-carcass components are an important part of the sheep farmers’ economies. One of the few studies conducted on offals concluded that their commercial value represented 16.4% of the value of live animals and 15.9% of the carcass value (Delfa et al., 1999).

The carcass and non-carcass composition of Churra Tensina lambs are not well known. The purpose of this study was to assess the effect of feeding management (grazing- or concentrate-fed) on the carcass composition, wholesale cut, tissue percentages, intramuscular fatty acids, and the non-carcass components of Churra Tensina light lambs.

2. Materials and methods

2.1. Animal management and experimental design

Thirty-eight single male lambs (3.6 ± 0.08 kg live weight at birth) were selected from the experimental flock of “La Garcipollera” Research Station (945 m a.s.l., north-eastern Spain). After birth, lambs remained indoors with their dams for some days to ensure maternal bonding. Ewes and lambs were then randomly allocated to two adjacent paddocks ($n = 19$). Lambing date, parity, body condition score and live weight of ewes and lambs were taken into account to balance groups. The treatments were

1. *Indoor* (IND): lambs were housed indoors (10×10 m²) and ewes grazed eight hours a day (0800–1600 h) without their offspring and received a supplement of barley meal (119 g/kg CP, 248 g/kg NDF on DM basis) after grazing. Lambs were fed concentrate *ad libitum* (182 and 167 g/kg CP, 190 and 212 g/kg NDF, on DM basis, the first month and subsequently). Lambs were weaned at 50–55 days of age (52.8 ± 0.86 days). Both ewes and lambs were given barley straw *ad libitum* (37 g/kg CP and 807 g/kg NDF, on DM basis).
2. *Grazing* (GR): lambs and dams were continuously stocked on a permanent pasture. No concentrate was available to dams or lambs. Lambs suckled their mothers and grazed until slaughter.

The pasture was composed of 22% legumes (mainly *Trifolium repens*), 68% grass (the main species were *Festuca arundinacea*, *Festuca pratensis* and *Dactylis glomerata*) and 10% other species (mainly *Rumex acetosa* and *Ranunculus bulbosus*). The stocking rate was 32 ewes per hectare (0.57 ha/treatment). For further details of daily intake, see Joy et al. (2008).

All the animals were supplied with a mineral vitamin supplement *ad libitum*. Procedures were conducted according to the guidelines of the Council Directive 86/609/EEC (European Communities, 1986) on the protection of animals used for experimental and other scientific purposes.

2.2. Slaughter procedure

When lambs reached 22–24 kg of live weight they were transported to the experimental abattoir at the Research Institute in Zaragoza, which is located 180 km from the farm. They were weighed on arrival and accommodated, until their slaughter, according to their original treatment. No fasting period was carried out. GR lambs received green forage and those from IND treatment received the same concentrate as that offered during the experimental period. Twenty hours after their arrival, lambs were slaughtered according to EU regulations.

The contents of the gastro-intestinal tract were weighed to calculate the empty body weight (EBW). Internal fat depots (pericardial, omental, mesenteric, pelvic and kidney), offal components and hot carcasses (HCW) were weighed. Offal

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