Characterization and Sheep Meat Quality of Finishing Breeds Specified for Markets Fin Cuts

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Abstract: The production of sheep worldwide is having greater growth due to the variability of products that can be obtained, such as meat, milk and wool. In the particular case of mutton, represents a natural source of micronutrients necessary for the various functions performed by the human body. In Mexico, in recent years, it has presented an increasing demand for sheep production that fails to be supplied by the national production. Therefore, this research aimed to contribute to the development of the productive chain of sheep meat production in the central region of Mexico. Antemortem and postmortem productive variables were evaluated in some finishing lamb breeds (Texel, Dorset and Ile de France). Based on the results it was observed that the finishing lambs Texel breed had a feed conversion ratio (4.55) and dry matter intake (1450 g/d) whose results represent greater efficiency when compared to the rest of finishing lambs cross breeds; however, the finishing cross breed Ile de France had the highest slaughter weight (56.78 kg). Regarding the water holding capacity, the finishing breed cross Ile de France presented a value of 20.51 which represents an important variable because it affects the visual attraction and sensory acceptance. According to the results obtained, it can be concluded that the use of finishing crosses breeds allows obtaining animals with a higher production, so it can be exploited for producing fine cuts since this market represents both a national and international opportunities.
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1. Introduction

The importance of sheep production is due to the use of its meat and wool for human. Sheep meat is a natural source of essential micronutrients, which are necessary for the proper functioning of the human body. So that it is a food that according to the nutritional recommendations may be included in a varied balanced and sufficient diet (Santaliestra-Pasías *et al*., 2010). Worldwide, sheep farming is becoming a livestock activity of great importance, due to the need to satisfy the growing demands for sheep meat for human consumption. There are countries that produce large amounts of meat and import a high proportion for domestic consumption; countries like England and France require 220,000 tons of sheep meat yearly to meet domestic demand (Acero, 2005).

In Mexico there is a growing demand for more than 85,000 tons of mutton; of which almost 40,000 tons are imported (Martínez-González *et al*., 2011). Therefore, the current research aimed to study the development of sheep meat productive chain in the central region of Mexico; throughout studying some antemortem and postmortem productive variables in some finishing lamb breeds including Texel, Dorset and Ile de France.

2. Materials and methods

2.1. Crossing and reproductive management

A baseline herd of 250 females of hair breed characteristics (genotype, age, parity) as homogeneous as possible were employed. In order to have uniform lambing, all females sired by sires of Texel, Dorset and Ile de France breeds. To be more representative of each breed, different sites that are unrelated were used.

2.2. General Management and feeding

Throughout the trial, sheep received the same type of management. The herd was vaccinated against clostridiasis and sampled monthly for coproparasitoscopic analysis, identified the need and type of treatment required. The feeding program consisted of the consumption of whole diets formulated to meet the nutritional requirements of each stage of production. Animals had free access to drinking water all the time. All male lambs product of crosses were weighed at birth and at 30, 60 and 90 days after birth, and then weighed every 28 days to reach market weight.

2.3. Slaughter and evaluation of carcass characteristics

Lambs were slaughtered, when they reached a weight of 51.63 kg on average. After gutting and skinning of animals, carcasses were weighed and

stored for 24 h in a cooling chamber maintained at a temperature of 0-4 °C, after which the classification was made according to the NMX-FF-106 -SCFI-2006 standard, and the thickness of the fat cover was measured. Subsequently, the pH measurements of the *longissimus dorsi* muscle, and the color of muscle and fat (perirenal and subcutaneous) were performed. In addition, morphometric measurements (width and length of the leg, chest width, loin long, etc.) of the carcasses were performed following the methodology described by Torrescano *et al*. (2009). The determine of the *Longissimus thoracis* and *lumborum* muscles surface, the middle carcass left rib of the space that is located between the 12th and 13th thoracic vertebra, was performed using a fine-tipped pen; muscle outline was drawn on acetate paper. Later in the laboratory of meat quality of CENIDs-Physiology and Animal Improving of INIFAP, planimetry muscle surface with a digital planimeter was performed to determine the muscle area. Additionally, the distance measured from the larger diameter in the lateral direction half (A) and the smaller diameter in dorsal-ventral direction (B). Then, the shoulder of the left halves was removed and vacuum sealed to keep at -18 °C until final dissection, which was separated and quantified the amount of muscle, bone and fat. Sampling of meat for the instrumental and sensory analysis included 3 sections of *Longissimus dorsi*, one of the T6 to T13 for water holding capacity (WHC), in addition to using the technique of centrifugation or drip loss (Cañeque and Sanudo, 2005), moisture and chemical analysis and one of L1 to L6 for sensory analysis. Samples that were not used immediately were vacuum packaged and frozen at -18°C until analysis.

2.4. Instrumental analysis of meat

The WHC was conducted by the "pressure method" described by Grau and Hamm (1953) and modified by Sierra (1973), in which the percentage of water released by subjecting the samples to a specific pressure was calculated (Pla Torres, 2005). Muscle color was measured by physical analysis, which is based on the different light reflection of radiation in the visible spectrum and measuring the lightness (L*), redness (a*) and yellowness (b*); also calculates the pitch (h *) and saturation (Ch*). For this analysis, a spectrocolorimeter was used according to the methodology proposed by Honikel (1998).

2.5. Sensory analysis of meat

Conducted a multiple comparison test of consumers with four simultaneous samples. For this purpose, samples were thawed by rapid method 4 h before starting the sessions. After breaking the vacuum, samples were slightly dried and placed in aluminum foil to prevent excessive drying. Subsequently, they were placed in a double electric grill plate for cooking. The samples were transferred to a cutting board where the edges were removed and excess connective tissue and fat before being cut into 8 pieces that were evaluated homogeneous by tasters. Each piece is enveloped in aluminum foil, was coded with three-digit and placed in a heating vessel provided with a thermostat to maintain the sample at a temperature of 60 to evaluation (Guerrero, 2005). In the sensory analysis of consumers participating individuals representing the general population, of different status, education, age and sex, but with the habit of eating mutton, who assessed the degree of tenderness, flavor quality and overall acceptability meat. The tastings were conducted in a series of 5 sessions with 2 courses each session and 4 samples per plate. The order of presentation of the samples was different for each consumer to avoid associated effects (MacRae *et al*., 2005). Before each session, each consumer group was explained for the job and provided with the necessary materials for evaluation.

2.6. Statistical analysis

Data of the experiment was analyzed in a completely randomized design with four treatments with evaluating the effect of time using the MIXED procedure of SAS (SAS 2002, North Carolina, USA).

3. Results and discussion

3.1. Antemortem parameters

The productive variables evaluated were dry matter intake (DMI), average daily gain (ADG) and feed conversion (FC) (Table 1). Table (1) shows the weight of lambs was statistical differed ($P < 0.05$) between treatments. The finishing crosses breed Dorset had an ADG 35.4% higher than the rest of the genotypes as well as a DMI higher (1570 g/d). However, crosses Texel breed had a FC more efficient (4.55) and a lower DMI (1450 g / d) compared to the rest of the crosses.

In general, the Dorset crosses breed had the highest weight followed by Ile de France crosses, and had higher FC and DMI than Texel. In the present study we can highlight what Partida (2009), and Osikowski (1976) who observed that the finishing cross breeds increased the value of multiple productive parameters within which the weight gain of the animals and the growth rate were founded.

3.2. Parameters post mortem

Table 2 shows some parameters of carcass quality. In general, the crosses Texel had the lowest slaughter weight (48.16 kg) compared to other crosses, in turn showed a weight of cold carcass (26.55 kg) higher than crosses Dorset; however, when comparing the other variables, it can be seen than this cross was the best performance, because although the Ile de France crosses had a greater slaughter weight (56.78 kg) showed performance similar to the results of Texel crosses. Similar results to those were found by Hernan

and Paz (2007) regarding the weight yielded the intermediate finishing crosses Texel breed and in the case of cross Dorset corresponded to what was found by the same authors in the length of the carcass.

The water holding capacity (WHC) is associated with the juiciness; crosses the Ile de France presented a value of 20.51 of this variable. According to Hughes and colleagues (2014), the WHC along with other variations occurring in sheep meat such as color and tenderness are very important because they affect the visual attraction and sensory acceptance and economically represent an important. It also found that poor WHC represents significant losses in carcass, cuts and may also affect the yield and quality of processed meat.

Although this cross Ile de France scored lower values (6.02 and 3.41 cm) in the largest diameter of *Longissimus dorsi* (DML.d.) and the smaller diameter of Longissimus dorsi (DmL.d.), respectively, obtained an area of *Longissimus dorsi* (19.33 cm) significantly higher than the rest of the crosses. In turn showed higher thickening (5.20) to the remaining carcasses. For pH values of 5.67 (Dorset), 5.56 (Texel), 5.89 (Ile de France) were obtained. The muscle pH of living animals is normally around 7.4, but after death pH falls due to muscle's glucose convert into lactic acid; before all the glucose has been consumed in the muscle the pH stabilizes at about 5.5 – 5.8 (Corry, 2007).

The pH value has an effect on color, shelf life, taste, microbiological stability, yield and texture. Thus, whereas bacterial proteolytic enzymes operate best near neutrality, the enzymes which attack carbohydrates tend to have optima below 6; and organisms such as lactic acid bacteria, of which the predominant activity is carbohydrate breakdown, have optima between pH 5.5 and 6 (Lawrie, 2006).

Table 1. Production parameters in finishing sheep breeds

	Texel	Dorset	Ile de France
Daily weight gain (g / d)	318^{b}	376^{a}	368^{a}
Dry matter intake (g/d)	1450^{ab}	1570^{a}	1510^{b}
Feed conversion	4.55^{a}	4.17^{b}	4.1^{b}

Mean in the same row with different letter indicate significant differences (P<0.05)

Table 2. Morphometric measurements of finishing lambs carcass breeds

	Dorset	Texel	Ile de France	SEM
Slaughter weight (kg)	49.35^{b}	48.16^{b}	56.78^{a}	1.735
Cold carcass weight (kg)	25.99^{b}	26.55^{ab}	27.89^{a}	0.759
Carcass long (cm)	66.34	65.33	65.20	0.347
Hindquarters perimeter (cm)	67.56	68.13	69.45	1.945
Hindquarters width (cm)	23.97^{b}	24.46^{a}	25.83^{a}	0.590
Wider chest (cm)	24.99^{c}	28.35^{b}	29.95^{a}	0.508
Smaller width of the chest (cm)	23.46^{b}	22.78^{b}	23.70^{a}	0.706
Heart girth (cm)	86.11^{a}	83.34^{b}	86.15^{a}	2.569
Length of the leg (cm)	46.75^{a}	41.12^{b}	47.15^{a}	0.780
Internal chest depth (cm)	30.31	33.15	30.8	2.98

Mean in the same row with different letter indicate significant differences (P<0.05)

Table 3. Variables of *Longissimus dorsi* muscle in finishing lambs breeds

	Dorset	Texel	Ile de France	SEM
Water holding capacity (%)	18.34	19.76	20.51	1.109
Area *L. d.* (cm)	16.70^{b}	17.54^{b}	19.33^{a}	1.346
Largest diameter of *Longissimus dorsi*	6.35	6.11	6.02	0.056
Smaller diameter of *Longissimus dorsi*	3.12^{b}	3.56^{a}	3.41^{a}	0.068
Fat (%)	4.70^{b}	4.87^{b}	5.20^{a}	0.496
Temperature (°C)	16.89^{b}	17.22^{b}	19.25^{a}	0.467
pH	5.67^{a}	5.56^{b}	5.89^{a}	0.031

4. Conclusion

Obtained results shows that the use of finishing crosses breeds allows obtaining animals with a higher production that can be exploited for producing fine cuts since this market represents both a national and international opportunities.

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References

1. Acero CM. El papel de México y América Latina en el comercio mundial de carne ovina. XXXIII Reunión de la Asociación Mexicana de Producción Animal A. C. y XIX Reunión de la Asociación Latinoamericana de Producción Animal A. C. Tampico Taps; 2005.
2. Corry JEL. Spoilage organisms of red meat and poultry. P. 101 – 122. *In*: Mead, G.C., Ed. Microbiological analysis of red meat, poultry and eggs. CRC Press, USA; 2007.
3. Grau, R. und Hamm, R. 1953. Eine einfache methode zur bestimmung der wasserbindung in muskel. *Naturwissenschaften*, 40: 29.
4. Guerrero L. Análisis sensorial de la carne. Panel entrenado. In: Cañeque V, Sañudo C (Eds). Estandarización de las metodologías para evaluar la calidad del producto (animal vivo, canal, carne y grasa) en los rumiantes. Madrid, España. pp. 395–408; 2005.
5. Hernan Felipe, Gallardo Paz. Cruzamientos terminales y engorda de corderos híbridos sobre praderas mejoradas en Aysén. Boletín Instituto de Investigaciones Agropecuarias (INIA). N°171; 2007.
6. Honikel KO. Reference methods for the assessment of physical characteristics of meat. Meat Sci 1998; 49:447-457.
7. Hughes JM, Oiseth SK, Purslow PP, Warner RD. A structural approach to understanding the interactions between colour, wáter-holding capacity and tenderness. Meat Sci 2014; 98:520-532.
8. Lawrie RA. Lawrie's Meat Science. CRC Press, USA; 2006.
9. MacRae J, O´Reilly L, Morgan P. Desirable characteristics of animal products from a human health perspective. Livest Prod Sci 2005; 94:95-103.
10. Martínez-González S, Macías Coronel H, Moreno Flores LA, Zepeda García J, Espinoza Moreno ME, Figueroa Morales R, Ruiz Felíx M. Análisis económico en la producción de ovinos en Nayarit, México. Abanico Veterinario 2011; 1(1):37-43.
11. Osikowski M, Bory M. Effect on production and carcass quiality characteristics of wether lambs of crossing Black-headed mutton, Ile the France and texel rams with Polish Merino ewes. Livest Prod Sci 19763:343-349.
12. Partida PJ. Uso de cruzamientos en ovinos para la producción de carne de alta calidad. Folleto técnico No. 3, INIFAP, México; 2009.
13. Pla Torres M. Capacidad de retención de agua. En: Cañeque, V., Sañudo, C. (Eds.), Estandarizaciñn de las metodologías para evaluar la calidad del producto (animal vivo, canal, carne y grasa) en los rumiantes. Monografías INIA: Madrid, España. Serie Ganadera N 3, pp. 243-250; 2005.
14. Santaliestra-Pasías AM, Mesana MI, Moreno LA. La carne en la alimentación española: importancia de la carne de cordero. Nutr Clín diet hosp 2010; 30(3):42-48.
15. SAS. System for Windows. SAS User's Guide Statistics. SAS Inst. Inc. Cary. North Carolina. USA; 2002.
16. Sierra I. Aportación al estudio del cruce Blancho Belga X Landrace: Caracteres productivos, calidad de la canal y de la carne. Trabajos I.E.P.G.E.-C.S.I.C., pp. 16. 43; 1973.
17. Torrescano GR, Sánchez A, Peñúñuri FJ, Velázquez J, Sierra T. Características de la canal y calidad de la carne de ovinos Pelibuey, engordados en Hermosillo Sonora. Bio Tecnia 2009; 11(1):41-50.

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