



Contents lists available at ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

Effect of the Dorper breed on the performance, carcass and meat traits of lambs bred from Santa Inês sheep

D.A. Souza^{a,*}, A.B. Selaive-Villarroel^a, E.S. Pereira^a, E.M.C. Silva^b, R.L. Oliveira^c^a Department of Animal Science, Federal University of Ceará—UFC, Fortaleza, CE, 60455-900, Brazil^b Department of Food Technology, Federal University of Ceará—UFC, Fortaleza, CE, 60455-900, Brazil^c School of Veterinary Medicine and Animal Science, Federal University of Bahia—UFBA, Salvador, BA, 40170-110, Brazil

ARTICLE INFO

Article history:

Received 8 March 2016

Received in revised form 17 August 2016

Accepted 15 October 2016

Available online 18 October 2016

Keywords:

Dorper

Crossbred lambs

Feedlot

Carcass

Meat

ABSTRACT

The objective of this study was to evaluate the effect of the Dorper breed on the growth performance, feed efficiency, carcass and meat traits when crossbred with Santa Inês sheep raised under an intensive production system in the northeastern region of Brazil. Twenty-four lambs were used in this trial under a fully randomized design. The lambs were housed and creep fed until weaning at 62 days of age. After weaning, they were sent to a feedlot for finishing with a high-energy diet until slaughter, which occurred when the lambs attained a 3 mm thickness of subcutaneous fat. The Dorper crossbred lambs exhibited a higher daily gain (223.8 g/day) than the Santa Inês pure lambs (168.1 g/day) and attained the slaughter fat thickness (132 days) more quickly. Significant differences were observed between the crosses and the Santa Inês lambs in terms of the carcass weight, rib eye area, carcass and leg compactness indexes, weight and dressing of commercial cuts and the muscle:bone ratio. According to the results obtained under the described experimental conditions, at the same maturity level, the growth performance, the age at slaughter and the main carcass characteristics were conclusively improved by crossbreeding of the Santa Inês ewes with the Dorper rams, making the use of local sheep breeds possible, to efficiently meet the needs of the domestic market.

Published by Elsevier B.V.

1. Introduction

With a herd of 14.1 million heads (IBGE, 2009), the sheep meat industry has been developing significantly in all regions of Brazil, and the expansion of the domestic market is supported by the association between high demand and limited supply. However, the large urban centers currently demand high-quality cuts provided from early maturity lambs from producers who are able to provide carcasses with good conformation and yield, adequate fatness and high lean meat percentage.

Generally, local or indigenous sheep breeds exhibit a lower growth rate and feed efficiency, as well as poorer carcass traits and yield (Canto et al., 2009; Cartaxo et al., 2011; Deng et al., 2012; Tsegay et al., 2013). Such characteristics result in less-efficient production systems and do not address the needs of the sheep industry. Consequently, the use of techniques such as creep feeding, feedlot

finishing and crossbreeding with exotic meat breeds is necessary to efficiently produce high-standard lambs in order to satisfy market requirements.

The Santa Inês is actually the largest local sheep breed population in Brazil and has an 51% share on the flocks in northeastern Brazil (Costa et al., 2007), where it is commonly used in crossbreeding with the Dorper breed to produce fast-growing, meaty lambs (Souza et al., 2013; Gallo et al., 2014; Galvani et al., 2014).

The Santa Inês breed has high adaptability to tropical ecosystems (Bezerra et al., 2011) and it is the closest local sheep breed to commercial exotic breeds as Suffolk (Carneiro et al., 2010; McManus et al., 2010) but it exhibits inferior characteristics about some key aspects for the production of meat such as finishing precocity and muscularity (Cartaxo et al., 2011).

The use of Dorper as the terminal sire breed has been studied recently under several conditions in various countries in the Americas (Canto et al., 2009; Osorio-Avalos et al., 2012; Shackelford et al., 2012; Yeaman et al., 2013), Africa (Kariuki et al., 2010; Tsegay et al., 2013, 2014) and Asia (Deng et al., 2012), and increasingly is one of the more successful exotic sheep breeds in Brazil.

The objective of this study was to evaluate the effect of the use of increasing levels of the Dorper genotype on growth performance,

* Corresponding author.

E-mail addresses: dansouza.07@hotmail.com, prime.asc@outlook.com(D.A. Souza), arturoselave@gmail.br (A.B. Selaive-Villarroel), elzania@hotmail.com (E.S. Pereira), elisabeth.cunha@gmail.com (E.M.C. Silva), ronaldoliveira@ufba.br (R.L. Oliveira).

Table 1
Ingredients and chemical composition of the finishing ration, % dry matter.

Ingredients	
Elephant grass hay (<i>Pennisetum purpureum</i>)	25.0
Ground corn	51.0
Soybean meal	22.1
Calcitic lime	1.1
Ammonium chloride	0.5
Minerals	0.3 ^a
Chemical composition	
Dry matter	89.9
Crude protein	18.6
Ether extract	3.3
Ash	6.7
Neutral detergent fiber	32.8
Acid detergent fiber	18.3

^a Mineral mixed: Na 13.2%, Ca 8.2%, P 6%, S 1.17%, Fe 700 ppm, Zn 2.600 ppm, Mn 1.200 ppm, F 600 ppm, Cu 350 ppm, Mo 180 ppm, I 50 ppm, Co 30 ppm, Cr 11.7 ppm, Se 15 ppm.

feed efficiency and carcass and meat traits of lambs produced from Santa Inês ewes and raised in an intensive production system.

2. Materials and methods

The experiment was performed at the “Valley of Curu” Experimental Farm, Department of Animal Science and Department of Food Technology of the Federal University of Ceará, which has campuses in the cities of Pentecoste and Fortaleza, Ceará, Brazil.

The “Valley of Curu” Experimental Farm is located in Pentecoste city to 3°47' latitude south and 39°16' longitude west Gr. The climate type is BSw, h, using Köppen classification, with the rainy season extending from January to June and a dry season which runs from July to December. The historic average for annual rainfall is 806 mm presenting average temperature of 27.3 °C with 54.8% of annual relative humidity. The sheep flock has about 150 Santa Inês and ½ Dorper × Santa Inês ewes.

Eight lambs (four males and four females) from each Santa Inês (SI), ½ Dorper × Santa Inês (½ DO × SI) and ¾ Dorper × Santa Inês (¾ DO × SI) genetic group, born and reared as singles, and chosen randomly, were used in this study. From the third week after birth to weaning at 62 days of age (rearing phase), the lambs were maintained under the same management in a creep feeding system under confinement and with overnight suckling. After weaning, during the feedlot finishing phase, the lambs were housed in shaded brickwork individual pens (1.5 × 0.7 m) equipped with feeders and water suppliers, and fed rations (Table 1) prepared in accordance with the NRC (2007). The rations were provided daily *ad libitum* as a total mixed ration, which was delivered as two meals, the first at 0900 h and the second at 1700 h. The food supply was adjusted daily to yield 10% in remains in relative to the natural matter, which was weighed to determine the dry matter intake.

For calculation of the daily gain, the lambs were weighed every 14 days from weaning until the end of the experiment. The weights were taken after 16 h fasting to minimize error.

The lambs were slaughtered when they reached 3 mm of subcutaneous fat thickness (UC), as determined by ultrasound. The fat thickness was monitored and measured every 14 days using an SSD 500 V (Aloka®, Tokyo, Japan) ultrasound machine equipped with a 3.5 MHz linear array transducer (UST-5011-3.5, Aloka®, Tokyo, Japan) and stand-off pad. The measurements were assessed between the 12th and 13th thoracic vertebrae on the fat cover over the *longissimus thoracis et lumborum* muscle. The body condition score was also assessed using a scale of 1–5 with intervals of 0.25.

The lambs were slaughtered at a commercial abattoir, and the following data were recorded: body weight at slaughter (BWS), hot carcass weight (HCW), cold carcass weight (CCW), carcass

shrinkage (CS), hot dressing percentage (HDP) and cold dressing percentage (CDP). A conformation and fatness evaluation was also performed using a scale of 1–5 with intervals of 0.5.

To calculate the carcass and leg compactness indexes, the CCW/L and leg weight/F, respectively, the following measurements were taken: leg length (F; distance between the anterior edge of the *symphysis pubis* and the inner edge of the tarsal-metatarsal joint surface), and internal carcass length (L; distance between the anterior edge of the ischiopubic symphysis and the anterior edge of the first rib at its mean point).

The carcass was fabricated into commercial cuts (leg, loin, ribs, lower ribs, neck and shoulder). The cuts were weighed, vacuum packaged and stored under freezing. On the *longissimus thoracis et lumborum* muscle between the 12th and 13th thoracic vertebrae, measurements were taken of the maximum width (A), the maximum depth (B) and the subcutaneous fat thickness (C) over the B. The grade rule (GR) was measured in this moment. The rib eye area (REA) was assessed by using the formula: $REA = (A/2 \times B/2) \times \pi$.

The loin (*longissimus dorsi* muscle) was used for the meat chemical and physical analyses, whereas the leg was submitted to tissue dissection. For all analyses and for the tissue dissection, the cuts were thawed at 4 °C over 24 h prior to use. With the exception of the IMF (duplicate) and SF (quintuplicate), all analyses were performed in triplicate.

To determine the muscle:bone ratio and muscle dressing percentage (MDP), each left leg was physically dissected into muscle, fat, bone and other tissues (tendons, ligaments, nerves, and blood vessels), and each component was weighed as described by Notter et al. (2004).

Minced and homogenized samples were used to evaluate the pH by use of a calibrated digital potentiometer TEC-05 (Tecnal Ltda.®, São Paulo, Brazil) with a glass electrode.

The loss of weight due to cooking (LWC) was determined according to a procedure described by Liu et al. (2004). The samples, composed of three loin slices of approximately 2.5 cm thickness, were weighed, vacuum packaged, and then cooked by immersing the individual bags in an 85 °C TE-057 water bath (Tecnal Ltda.®, São Paulo, Brazil) for 25 min. After cooking, the bags were cooled at room temperature before opening to drain the liquid. Then, the samples were weighed again, and the results were expressed as a percentage (g/100 g).

For water-holding capacity (WHC), the minced and homogenized samples were mixed in a NaCl (0.6 M) solution and centrifuged at 10,000 rpm for 15 min in a J2-21 centrifuge (Beckman Inc.®, California, USA) at approximately 4 °C (Miller and Groninger, 1976). The result was expressed in milliliters of water absorbed per 100 g of meat.

The texture was evaluated through the shearing force (SF), according to the methodology described by Duckett et al. (1998) but with fresh meat samples. Five 3.0 cm cylinders were removed parallel to the muscle fiber with a mechanical coring device. Cylinders were sheared using a TA.XTPlus Texture Analyzer (Stable Micro System Ltd.®, Surrey, UK) equipped with a Warner-Bratzler blade, operating at 20 cm/min. The peak shearing force was recorded, and the result was expressed in kilograms.

For the IMF analysis, loin slices were trimmed of all visible external fat and then minced and homogenized. Five-gram samples were taken and processed for moisture. Then, the samples were submitted to lipid extraction with hexane in a TE-044 Fat Determination System (Tecnal Ltda.®, São Paulo, Brazil), followed by evaporation of the solvent in an oven at 105 °C. The results were expressed as a percentage (g/100 g).

Instrumental color measurements of the meat were performed directly on the transversal surface of the *longissimus dorsi* muscle using a calibrated colorimeter CR410 (Minolta Co.®, Osaka, Japan). Random readings were taken at three different locations of each

Download English Version:

<https://daneshyari.com/en/article/5544324>

Download Persian Version:

<https://daneshyari.com/article/5544324>

[Daneshyari.com](https://daneshyari.com)