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Original

Carcass and meat of Santa Inês lambs and crosses with Dorper or Texel: A meta-analysis

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ABSTRACT

Objective. To evaluate the quantitative characteristics of the carcass and chemical composition of the meat of purebred Santa Inês (SI) lambs and crosses with Dorper (DO-SI) or Texel (TX-SI), finished in feedlot or semi-feedlot, through a meta-analysis. **Materials and methods.** Virtual databases such as *Google Scholar*, *Science Direct* and *Scielo* were used to select scientific articles published from 2000 to 2019. Keywords such as genotype, lambs, carcass characteristics and meat quality, both in Spanish, Portuguese and English were used as criteria for the inclusion of articles. From each genetic group were evaluated: animal performance, quantitative characteristics of the carcass, carcass cuts and chemical composition of the meat. These variables were included in the analysis from 37 scientific articles. **Results**. Final body weight, hot carcass weight, cold carcass yield and muscle percentage do not differ between the different genetic groups evaluated. DO-SI lambs showed higher dry matter intake, daily weight gain, loin eye area and loin percentage. Chemical composition was not influenced by the genetic groups. **Conclusions**. In a tropical and subtropical environment, purebred lambs SI finished in feedlot or semi-feedlot have quantitative characteristics of the carcass and chemical composition similar to DO-SI and TX-SI lambs.

Keywords: Breeds; carcass yield; feedlot; meat quality; sheep (*Source: CAB*).

RESUMEN

Objetivo. Evaluar las características cuantitativas de la canal y composición química de la carne de corderos puros Santa Inés (SI) y cruces con Dorper (DO-SI) o Texel (TX-SI), terminados en confinamiento o semiconfinamiento, mediante un meta-analysis. **Materiales y métodos.** Bases de datos virtuales como *Google Scholar*, *Science Direct* y *Scielo* fueron utilizados para seleccionar los artículos científicos publicados desde el año 2000 a 2019. Palabras clave como genotipo, corderos,

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características de la canal y calidad de la carne, tanto en idioma español, portugués e inglés fueron utilizadas como criterios de inclusión de los artículos. De cada grupo genético, fueron evaluados: desempeño animal, características cuantitativas de la canal, cortes de la canal y composición química de la carne. Todos fueron incluidos en el análisis proveniente de 37 artículos científicos. **Resultados.** Peso corporal final, peso de la canal caliente, rendimiento de la canal fría y porcentaje de músculo no difieren entre los diferentes genotipos evaluados. Corderos DO-SI presentaron mayor consumo de materia seca, ganancia diaria de peso, área de ojo de lomo y porcentaje de lomo. Composición química no fue influenciada por los genotipos. **Conclusiones.** En ambiente tropical y subtropical, corderos puros SI terminados en confinamiento o semiconfinamiento presentan características cuantitativas de la canal y composición química similar a los corderos de cruces DO-SI y TX-SI.

Palabras clave: Calidad de la carne; confinamientos; ovinos, razas; rendimiento de la canal (*Fuente: CAB*).

INTRODUCTION

It is expected that in the near future, as global population grows, not only the demand for food products will increase, including meat, but consumers will be more and more demanding with respect to quality, which includes the release of adequate information about the production system, nutrition, sustainability and compliance with animal welfare and environmental standards (1).

Researches in the sheep industry have sought to respond to these issues in a sustainable manner, improving the practices in use or rediscovering strategies for supplying meat with sustainable quality, environmentally safe and profitable for producers. The central region of South America, comprised by the Cerrado biome, part of Pantanal and Atlantic forests, is home to a diversity of sheep genotypes bred for meat production, though still with a low level of expertise in production systems (2).

One of the strategies to develop sheep breeds well-adapted to the climate and with high meat yields is to combine genotypes through crossbreeding. The use of different genotypes allows producers to choose the breeds according to their production objective and the infrastructure available, because genotypes vary in their ability to adapt, in carcass constitution and maturity at different slaughter ages (3). The genotype has influence on weight gain and carcass quantitative traits, which shows that crossbreeding in sheep flocks is necessary in order to explore breed complementarity and heterosis to achieve the best yields and the desirable carcass traits (4) and explore positively the meat quality attributes (5). Crossbreeding can be a useful tool in the sheep meat industry and to enhance farm's profitability (6).

Santa Inês sheep is one of the most important locally-adapted sheep breeds in Brazil and its production has expanded throughout South America. This sheep breed became popular probably because of its exceptional resistance, fertility, maternal ability and adaptability to diverse soil and climate conditions. Santa Inês sheep is part of the Brazilian genetic, historical and cultural heritage. If properly used, according to diverse environments and production systems, it can be very important for the development of the sheep industry (7).

Sheep genotypes such as Texel and Dorper have defined patterns and body conformation for meat production in tropical lands (8,9), although with a smaller and more compact body structure, while Santa Inês has low potential for meat production. Although its body constitution is of a rustic animal, it can be raised in environments with soil and climate adversities (9), which is the reason why its use as matrix or maternal breeding with meat-specialized breeds such as Dorper and Texel is largely used in the tropics.

Different results are found in the literature with respect to the influence of genotypes on the sheep carcass and meat characteristics. The use of the Dorper genotype crossbred with Santa Inês improves its composition (10) and carcass finish, raises yields (11) and produces meat with more muscle accumulation and less fat in the carcass, thus has a more appropriate nutritional profile for human consumption (12), though the Santa Inês genotype has performance and carcass traits similar to those of Santa Inês x Dorper crossbred sheep (13).

Probably due to heterosis, lambs of Santa Inês crossed with specialized breeds exhibit superior carcass traits and different meat chemical composition. However, continuous genetic improvement has contributed to the popularization of the Santa Inês genotype. In fact, some research studies present this breed as having the same conditions of carcass characteristics and meat chemical composition when compared with specialized crosses. This raises the hypothesis of whether at present times crossbreeding is necessary to achieve best results of carcass and meat quality. Besides, there is a lack of studies for optimization of existing production systems and appropriate genotypes for sheep production in the central region of South America (4). Thus, this study aimed to assess the quantitative characteristics of carcass and meat chemical composition of purebred Santa Inês lambs and crossbred with Dorper and Texel by means of meta-analysis.

MATERIALS AND METHODS

Literature review and eligibility criteria. A bibliographic search was carried out on virtual databases such Google Scholar, Science Direct and Scielo to select studies that assessed carcass traits and meat chemical composition of lambs reared in tropical and sub-tropical environments. This review was carried out in four stages: identification, selection, eligibility assessment and inclusion, according to the PRISMA flowchart (14) (Figure 1).

Keywords in the Spanish language such as 1. "genotipo", 2. "corderos", 3. "calidad de la carne", 4. "características de la canal"; in Portuguese such as: 1. "genótipo", 2. "cordeiros", 3. "qualidade da carne", 4. "características da carcaça"; and in English such as: 1. "genotype", 2. "lambs", 3. "meat quality", 4. "carcass characteristic", were used in the search for publications, as well as studies conducted in tropical and sub-tropical environment. Articles published between years 2000 and 2019 were selected to compose the initial search data.

After the search, 90 articles of interest were found and selected, which contained at least one of the keywords in the title or abstract. Then, in the selection and assessment, the abstracts were read and 28 articles were excluded because they were studies conducted in temperate or arid climate regions. Thus, 62 articles were eligible and were read in full, according to the pre-defined eligibility criteria. After this stage, 25 articles were excluded for not containing "genotype", "lambs", "meat quality" or "carcass characteristic" keywords as studied variables. Thus, 37 studies were selected for the meta-analysis (Figure 1).

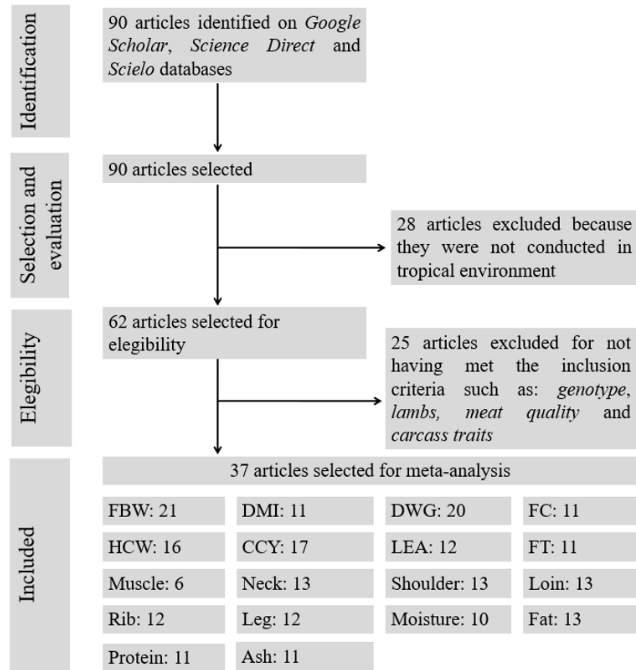

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart. FBW: final body weight; DMI: dry matter intake; DWG: (average) daily weight gain; FC: feed conversion; HCW: hot carcass weight; CCY: cold carcass yield; LEA: loin eye area; FT: fat thickness, percentages of muscle, neck, shoulder, loin, rib, and leg; and meat chemical composition (g/100g): moisture, fats, protein and ash.

Data input. The data of the different articles were classified according to the genotypes and variables of interest. In all, three different genotypes were examined, as follows: Santa Inês (SI), Dorper x Santa Inês (DO-SI) and Texel x Santa Inês (TX-SI). Animal performance, quantitative carcass characteristics, carcass cuts and chemical composition of the meat of each genotype were included in the analysis (Table 1). The information obtained from the abstracts, materials and methods used, results and discussion were organized in a spreadsheet. From carcass, the following traits were selected: final body weight (FBW), dry matter intake (DMI), average daily weight gain (DWG), feed conversion (FC), hot carcass weight (HCW), cold carcass yield (CCY), loin eye area (LEA), fat thickness (FT), and the percentages of muscle, neck, shoulder, loin, rib and leg. The meat chemical composition such as moisture, fats, protein and ashes were also examined for all three genotypes.

Table 1. Description of the primary study included in the meta-analysis (*n*= 37).

Study	Country	Feed system	Variables
(4)	Brazil	Feedlot	FBW, DMI, DWG, FC, HCW, CCY, LEA
(5)	Brazil	Feedlot	HCW, Moisture, Fats, Protein, Ash
(10)	Brazil	Feedlot	FBW, HCW, LEA, FT
(11)	Brazil	Feedlot	DWG, HCW, CCY, LEA, FT, Neck, Shoulder, Loin, Rib, Leg
(12)	Brazil	Feedlot	FBW, DMI, DWG, FC, HCW, CCY, LEA, Muscle, Neck, Shoulder, Loin, Rib, Leg, Fats, Protein, Ash
(13)	Brazil	Feedlot	FBW, DWG, HCW, CCY, FT, Neck, Shoulder, Loin, Rib, Leg
(15)	Brazil	Feedlot	FBW, HCW, CCY, LEA, FT, Neck, Shoulder, Loin, Rib, Leg
(16)	Brazil	Feedlot	FBW, DMI, DWG, CCY, Neck, Shoulder, Loin, Rib, Leg
(17)	Brazil	Feedlot	FBW, DMI, DWG, FC, HCW, CCY, LEA, FT, Neck, Shoulder, Loin, Leg
(18)	Brazil	Feedlot	DMI, DWG
(19)	Brazil	Feedlot	FBW, DWG
(20)	Brazil	Semi-feedlot	FBW, DWG, HCW, CCY, FT, Neck, Shoulder, Loin, Rib, Leg
(21)	Brazil	Feedlot	FBW, DMI, DWG, FC, CCY
(22)	Brazil	Feedlot	FBW, DMI, DWG, FC, HCW, CCY, LEA, FT, Neck, Shoulder, Loin, Rib, Leg
(23)	Brazil	Semi-feedlot	LEA, FT, Muscle
(24)	Brazil	Feedlot	FBW, DWG, Moisture, Fats, Protein, Ash
(25)	Brazil	Feedlot	FBW, DMI, DWG, FC
(26)	Brazil	Feedlot	FBW, HCW, LEA, FT, Muscle, Neck, Shoulder, Loin, Rib, Leg
(27)	Brazil	Feedlot	FBW, LEA, Muscle
(28)	Brazil	Feedlot	Moisture, Protein, Fats, Ash
(29)	Brazil	Feedlot	Fats
(30)	Brazil	Feedlot	Moisture, Fats, Protein, Ash
(31)	Brazil	Feedlot	Moisture, Fats, Protein, Ash
(32)	Brazil	Feedlot	Moisture, Fats, Protein, Ash
(33)	Brazil	Feedlot	FBW, DMI, DWG, FC
(34)	Brazil	Semi-feedlot	LEA, Muscle, Fats Protein, Ash
(35)	Brazil	-	Moisture, Fats, Protein, Ash
(36)	Brazil	Feedlot	FBW, CCY, HCW, FT
(37)	Brazil	Feedlot	FBW, DWG
(38)	Brazil	Feedlot	Muscle, Neck, Shoulder, Loin, Rib, Leg
(39)	Brazil	Feedlot	Neck, Shoulder, Loin, Rib, Leg
(40)	Brazil	Feedlot	HCW, CCY, Neck, Shoulder, Loin, Rib, Leg
(41)	Brazil	Semi-feedlot	FBW, HCW, CCY, Neck, Shoulder, Loin, Rib, Leg
(42)	Brazil	Semi-feedlot	Moisture, Fats, Protein, Ash
(43)	Brazil	Semi-feedlot	FBW, HCW, CCY
(44)	Brazil	Semi-feedlot	FBW, DMI, DWG, FC, HCW, CCY
(45)	Brazil	Semi-feedlot	FBW, DMI, DWG, HCW, CCY, LEA, FT, Neck, Shoulder, Loin, Rib, Leg

FBW: final body weight; DMI: dry matter intake; DWG: average daily weight gain; HCW: hot carcass weight; CCY: cold carcass yield; LEA: loin eye area; FT: fat thickness; FC: feed conversion.

Statistical analyses. The analyses were performed according to the following general mathematical model:

$$\gamma ijk = \mu + Ti + aj + \varepsilon ijk,$$

where γijk = dependent variables, μ = mean value of all observations, Ti = genotypes fixed effect, aj = random effect of the articles; and εijk = random residual error.

Following the residuals testing for normality, an analysis of variance using the statistical software AgroEstat® was carried out. Tukey's test for comparison of means with 5% level of probability was used. The variables DMI, FBW, CCY, DWG, shoulder, leg and ash were converted by means of log 10, because they did not indicate normality.

RESULTS

Distribution of the quantity of lambs according to the diverse variables is shown in details in Table 2. In the published studies, DO-SI lambs are more frequent than TX-SI crossbreds, that is, the latter has a smaller number of lambs studied for each of the variables in the present meta-analysis. The mean number of days in feedlot or semi-feedlot for the SI, DO-SI and TX-SI genotypes were similar.

The different genotypes assessed exhibited the same cut weight (FBW, $p>0.05$) varying from 32.02 kg for the SI lamb, 33.03 kg for the TX-SI breed type and 33.41 for DO-SI (Table 3). Dry matter intake (g/d) is significantly influenced by the genotypes ($p\leq0.05$), being higher for the DO-SI breed type, with 1144.3 g, while for SI the daily matter intake was 1003.3 g, and the TX-SI had the lowest intake (842.5 g, Table 3).

The average daily weight gain (DWG) is higher ($p\leq0.05$) for the DO-SI lamb types, with 0.230 kg/d, whereas for the SI lamb DWG was 0.194 kg/d, and for the TX-SI it was 0.160 kg/d. Feed conversion (FC), hot carcass weight (HCW), cold carcass yield (CCY), and the percentage of muscle were not influenced ($p>0.05$) by the genotypes studied. The loin eye area (LEA) and backfat thickness (FT) were influenced by the genotypes, being more significant for DO-SI, with 13.69 cm^2 and 2.97 mm, respectively, and lower for the SI lamb, with 11.62 cm^2 of LEA, and the FT was thinner for SI and TX-SI (Table 3).

Table 2. Number of lamb repetitions for the variables according to the genotypes examined.

Variables	Genotypes			Total
	Santa Inês (SI)	Dorper x Santa Inês (DO-SI)	Texel x Santa Inês (TX-SI)	
	Animal performance			
Final body weight (FBW, kg)	414	329	141	884
Dry matter intake (DMI, g/day)	114	136	68	318
Daily weight gain (DWG, g/day)	304	231	170	705
Feed conversion (FC, kg/kg)	136	100	96	332
	Carcass quantitative traits			
Hot carcass weight (HCW, kg)	286	201	135	622
Cold carcass yield (CCY, %)	300	199	151	650
Loin eye area (LEA, cm^2)	199	149	75	423
Muscle, %	109	61	45	215
Fat thickness (FT, mm)	194	178	94	466
	Carcass cuts			
Neck, %	189	137	83	409
Shoulder, %	189	149	83	421
Loin, %	201	149	83	433
Rib, %	191	129	83	403
Leg, %	201	149	105	455
	Meat chemical composition			
Moisture (g/100 g)	152	96	54	302
Fats (g/100 g)	215	157	71	443
Protein (g/100 g)	160	122	54	336
Ash (g/100 g)	160	122	54	336
	Days in feedlot or semi-feedlot			
Minimum	36.75	35.87	45	
Average	89.31	79.32	95.42	
Maximum	240	201	214	

The results found show the importance of crossbreeding to achieve better DWG and LEA. However, for the other quantitative carcass variables studied, the genotype does not exert a significant influence, indicating that the choice for one or another genetic group may occur according to the producer's preference. Although DWG was higher for the DO-SI type, in similar number of days in feedlot or semi-feedlot (Table 2), this does not reflect on a higher muscle percentage (p>0.05). Therefore, in absolute values, it was higher for the DO-SI breed types. It is likely that the weight difference is expressed in the increased fat thickness of the carcass (2.97 mm) of the DO-SI animals compared to the SI (1.94 mm) and TX-SI (1.79 mm) ones.

Loin (%) was the only meat cut that was influenced by genotype (p≤0.05), being higher for the DO-SI type lambs, with 11.84%, followed by the SI, with 8.82%, and by TX-SI, with 6.39%. Neck, shoulder, rib and leg were not influenced (p>0.05) by the genotypes studied (Table 4).

The genotype does not have influence on the carcass cut of greater interest, such as leg. This indicates that all genetic groups assessed may show similar results for the carcass cut.

Meat chemical composition was not influenced (p>0.05) by the genotypes studied (Table 5). This indicates that the assessed variables are independent from the genotype.

Table 3. Animal performance and quantitative carcass traits of different lamb genotypes.

Variable	Genotypes			SEM	p-value	n[1]
	Santa Inês (SI)	Dorper x Santa Inês (DO-SI)	Texel x Santa Inês (TX-SI)			
FBW (kg)	32.02	33.41	33.03	0.927	0.640	884
DMI (g/d)	1003.3a	1144.3a	842.5b	0.017	0.001	318
DWG (kg/d)	0.194ab	0.230a	0.160b	0.011	0.036	705
FC (kg/kg)	6.06	4.51	6.04	0.455	0.065	332
HCW (kg)	15.23	15.83	15.06	0.683	0.798	622
CCY (%)	46.83	47.56	45.34	0.685	0.208	650
LEA (cm^2)	11.62b	13.69a	13.18[a]	0.413	0.019	423
FT (mm)	1.94b	2.97a	1.79b	0.270	0.009	466
Muscle (%)	55.12	59.47	51.04	3.478	0.585	215

[1] n= number of repetitions, total lambs
[a,b] Values followed by different letters in rows differ significantly at 5% probability level, according to Tukey's testing.
SEM= Standard error of the means; FBW= final body weight; DMI= dry matter intake; DWG= daily weight gain (average); FC= feed conversion; HCW= hot carcass weight; CCY=cold carcass yield; LEA= loin eye area; FT= carcass fat thickness.

Table 4. Carcass cuts of different lamb genotypes.

Variable	Genotypes			SEM	p-value	n[1]
	Santa Inês (SI)	Dorper x Santa Inês (DO-SI)	Texel x Santa Inês (TX-SI)			
Neck (%)	8.25	7.06	7.33	0.348	0.131	409
Shoulder (%)	16.93	17.76	15.36	0.955	0.232	421
Loin (%)	8.82b	11.84[a]	6.39b	0.758	0.005	433
Rib (%)	27.67	29.31	25.97	1.478	0.565	403
Leg (%)	29.06	32.16	27.55	1.634	0.161	455

[1] n= number of repetitions, total lambs.
[a,b] Values followed by different letters in rows differ significantly at 5% probability level, according to the Tukey's test.
SEM= Standard error of the means.

Table 5. Chemical composition (g/100g) of *longissimus dorsi* muscle of different lamb genotypes.

Variables	Genotypes			SEM	p-value	n[1]
	Santa Inês (SI)	Dorper x Santa Inês (DO-SI)	Texel x Santa Inês (TX-SI)			
Moisture	74.05	73.61	75.29	0.451	0.387	302
Fats	3.07	3.56	3.49	0.335	0.733	443
Protein	21.63	21.54	20.40	0.528	0.642	336
Ash	1.13	1.15	1.30	0.052	0.425	336

[1] n= number of repetitions, total lambs
SEM= Standard error of the means.

DISCUSSION

Data summarization allows a better characterization of the genotypes with higher performance in DMI, DWG, LEA, and FT, which were superior in the DO-SI lambs (Table 3), although in other studies (10, 15, 16, 17, 18, 19, 20, 21) no significant differences for DWG and CCY were found between the DO-SI and SI genotypes. However, a higher DMI has been reported for DO-SI lamb compared with the SI (16, 18, 22). But in other study, no differences were found when the same genotypes were assessed (21). On the other hand, no differences were found for the variables FBW, DMI, DWG, FC, HCW, CCY between the DO-SI and SI genotypes, but a larger LEA was found for the DO-SI lambs (12) as well as differences for the LEA between SI and TX-SI lambs (23).

Significant differences for DWG between DO-SI and SI lambs (17, 18, 19, 24, 25) were not found, although other studies have reported differences between the DO-SI and SI breeds (22). Besides, there were no significant differences for DWG between the DO-SI, SI and TX-SI genotypes (20). The higher DWG found for DO-SI and SI relative to TX-SI (Table 3) does not reflect on a higher percentage of muscle. This difference in weight gains can be expressed in higher fat thickness. In other study, significant differences in the FBW and LEA for the SI and DO-SI breeds were observed. However, the DO-SI crossbred lambs exhibited greater FT (10). In addition, LEA and FT did not exhibit significant correlation (46). This indicates that the SI lambs have a leaner carcass with no influence on CCY and carcass finish.

Although the studied genotypes showed, on average, similar number of days in feedlot or semi-feedlot (Table 2), they did not have different physiological times (higher FT level for the DO-SI lambs). In this regard, slaughter criterion should be based on carcass finish and not on fixed finishing time (47).

Purebred SI lambs exhibited yields and carcass traits similar to crossbred DO-SI and TX-SI lambs (13). However, the TX-SI lambs exhibited greater potential for carcass and meat quality traits compared to the SI lambs (23). Higher LEA levels were found in the TX-SI breeds compared to purebred SI lambs. (11). The optimal cut weight of lambs is 35 kg live weight, at which time the highest meat yields and fat thickness are observed, compared with lambs slaughtered at 30kg (11). This data is reflected on the results obtained (Table 3), which show that the FBW varied from 32.02 kg for SI, 33.03 kg for TX-SI and 33.41 for DO-SI, that is, the lambs were slaughtered at the optimal time for achievement of better carcass yields.

Differences were neither found for LEA in DO-SI and SI lambs in three body conditions assessed, namely, lean, intermediate and fat (15), nor as a result of the level of energy intake (10, 26), although other studies reported significant differences for LEA, which was higher in DO-SI lambs compared to the SI genotype (17, 22, 27).

Similar results (Table 4) were observed in DO-SI and SI lambs, except for loin, which was proportionally higher in DO-SI crossbred lambs (16). The homogeneity with respect to the proportions of cuts may be due to the similar morphometric characteristics that have been reported between DO-SI and SI lambs (48), although they differ from the findings of other research in which a higher percentage of shoulder in SI lambs than in DO-SI crosses were found (22). A higher percentage of shoulder suggests that the animal travelled longer distances to find food to meet their daily nutritional needs (49).

Despite the fact that several studies (11, 17, 26) have found that animals from crosses exhibit better performance than pure breeds, especially regarding carcass cut yields, the summarization in the present meta-analysis allows a better comparison of data, showing that, for the carcass cuts proportions, except for loin, the purebred SI exhibits similar results to the ones of the DO-SI and TX-SI crossbreds. This suggests an advancement in the genetic improvement of hair sheep and wooled sheep to be specialized in meat production, mainly when finished in feedlot, considering that most of the studies examined here come from the mentioned system (Table 1).

The higher DWI and DWG values found in the DO-SI lambs (Table 3) do not reflect statistically on a better feed conversion in the same genotype, although numerically these were the best conversion ratios found (4.51 for DO-SI vs. 6.06 for SI and 6.04 for TX-SI). In addition, the higher LEA value observed for DO-SI (13.69 cm^2) statistically does not match with the greater muscle accumulation (59.47% see Table 3) or leg percentage (32.16%) (Table 4), though numerically there are differences. However, the larger LEA found for the DO-SI sheep seems to be related with a higher percentage of loin (11.84%, Table 4).

Such inconsistency for some of the variables may be due to the amount of data obtained and analyzed for each variable, considering that 11 articles were examined for DMI, 20 for DWG, 12 for LEA, 6 for muscle and 12 for leg (Figure 1, Table 1 and 2).

No statistical differences were observed between the DO-SI and SI genotypes for meat chemical composition (18,23,30,31). In this regard, neither breed, sex (32) or crude protein in diet (33) have influenced the meat composition of SI lambs and DO-SI crosses, although other study found a higher fat content in DO-SI than in SI lambs (34).

Initially, the focus of the meta-analysis was wider, so much so that “Santa Inês” was not included in the Keywords of the search. This is an indicative of the importance of the Santa Inês breed in the last 20 years and the limited number of significant studies on other breeds published in this period. In this regard, it is worth emphasizing that the present meta-analysis did not restrict the search to studies conducted in Brazil only. But it can be seen in Table 1 that, randomly, all articles that met the inclusion criteria were developed in this country, although the mentioned breed is also raised in other countries.

Concluding, Santa Inês lambs finished in feedlot or semi-feedlot exhibit carcass quantitative traits and meat chemical composition similar to the ones found in crossbred Dorper x Santa Inês and Texel x Santa Inês lambs. The Dorper x Santa Inês lambs were superior in dry matter intake, daily weight gain, loin eye area, fat thickness, and loin percentage. The Santa Inês lambs exhibited an average number of days in feedlot or semi-feedlot similar to the Dorper x Santa Inês lambs.

The carcass finish level must be the criterion to be used for slaughtering Santa Inês, Dorper x Santa Inês and Texel x Santa Inês genotypes, with no fixed finishing time.

The Santa Inês lambs are among the breeds most utilized in experiments that assess performance, carcass yield and meat quality in Brazil, exhibiting a leaner carcass, but which does not impair the carcass yield and finish.

Conflict of interests

The authors hereof declare that there is no conflict of interests with respect to the publication of this manuscript.

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