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Meat production performance from crossbreeding between locally-adapted hair sheep and specialized breeds

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ADDITIONAL KEYWORDS

Carcass.
Local genetic resource.
Mutton.
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SUMMARY

There are several options in sheep genetics for production systems, since local genetic resources (generally adapted to environmental conditions) to specialized breeds. Crossbreeding is an alternative to explore heterosis and complementarity between breeds. This study evaluated eight genetic groups from crossbreding between Santa Inês (SI), Poll Dorset (PD), Dorper (DO), East Friesian (EF), Primera (PR), and White Dorper (WD). SI and PD were used as maternal and paternal breed, while the others were used only as sires. Forty-eight male lambs were evaluated for withers height, thoracic perimeter, body and back length and skin thickness, as well as cold carcass weight and weights of commercial cuts such as neck, belly, shoulder, leg, rib and loin. Santa Inês took more time to reach the designated slaughter weight (30kg) than Dorper and Poll Dorset crosses. 87PDSI, 75PDSI and DOPD showed higher commercial cut weights and carcass yield. The use of Santa Inês, a locally-adapted hair breed, as maternal breed in crossbreeding system showed similar results to use of Poll Dorset, a meat specialized breed. These results highlight the usefulness of a local genetic resource in intensive system. Poll Dorset are recommended as sires for crossing with Santa Inês dams in intensive lamb rearing systems.

Desempenho de cruzamentos entre raças deslanadas localmente adaptadas e raças especializadas para produção de carne

PALAVRAS CHAVE ADICIONAIS

Carcaça.
Carne ovina.
Recursos genéticos locais.
Sustentabilidade.

RESUMO

Existem diversas opções de genética de ovinos para os sistemas de produção, desde recursos genéticos locais (geralmente adaptados as condições ambientais) até raças especializadas. O cruzamento é uma alternativa para explorar a heterose e complementariedade entre as raças. Este estudo avaliou oito grupos genéticos obtidos a partir do cruzamento entre Santa Inês (SI), Poll Dorset (PD), Dorper (DO), East Friesian (EF), Primera (PR), and White Dorper (WD). SI e PD foram usados com raças paternas e maternas, enquanto as demais foram usadas apenas como raças paternas. Quarenta e oito cordeiros foram avaliados para altura da cernelha, perímetro torácico, comprimento do corpo e da garupa e espessura da pele, bem como peso de carcaça fria e peso dos cortes comerciais como pescoço, fralda, paleta, pernil, costela e lombo. Os animais Santa Inês demoraram mais tempo para atingir o peso de abate (30 kg) que as cruzas com Dorper e Poll Dorset. Os animais 87PDSI, 75PDSI e DOPD apresentaram maior peso dos cortes comerciais e maior rendimento de carcaça. O uso da raça Santa Inês, uma raça localmente adaptada, como raça maternal em sistema de cruzamento apresentou resultados similares ao uso de Poll Dorset, uma raça especializada para produção de carne. Esses resultados destacam a utilidade dos recursos genéticos locais em sistema de produção intensivo. Poll Dorset é a raça paterna recomendada para o cruzamento com matrizes Santa Inês em sistema de produção intensivo.

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INTRODUCTION

Livestock is considered one of the most important means of food and economic security of the poor and marginal farmer (Sánchez-Dávila et al. 2015). Therefore, studies on adequate genetic, feeding and health management of herds in tropical regions is essential (Lemes, et al. 2014). Sheep have high genetic variability worldwide, which can be useful to explore specific functions in challenging environments. The hair breeds are important genetic resources in tropical regions due to their adaptation to adverse climates, resistance to heat, resistance/tolerance to external and internal parasites as well as absence of reproductive seasonality (Godfrey & Dodson 2003).

In Brazil, the demand for lamb is increasing, especially in large urban centers (Souza et al. 2013). Studies have shown that sheep production may not be economically viable in Central Brazil (McManus et al. 2011b), mainly due to high prices for replacement dams, dam maintenance costs, lamb mortality and low weight gain per day. For this activity to become viable, among other factors, appropriate feeding and breeding management is necessary to found an economically sustainable system (Ruviaro et al. 2016; Rose et al. 2015).

Evaluation of available genetic resources is important to assess their potential for crossbreeding to exploit both heterosis and complementarity to meet specific production and market goals (Álvarez et al. 2013). The Santa Inês bred is a local genetic resource and the main breed reared in Brazil, outside the Southern region (McManus et al. 2010; McManus et al. 2014). It has been used as both a maternal and paternal breed and is distributed in most ecosystems and rearing systems. Crossbreeding using fast growing sire lines is a rapid way of increase efficiency of production systems and has been applied in the tropics to exploit breed complementarity (Getachew et al. 2013; Vargas Junior et al. 2014; Blasco, et al. 2016).

At present there are thirty-one breeds registered by the Brazilian Association of Sheep Breeders and several of these have no information of their production under Brazilian conditions, either purebred or crosses. Moreover, studies comparing maternal breeds, locally adapted versus specialized meat breed, are scarce. Thus, the objective of this study was to evaluate eight different genotypes of lambs from two maternal breeds (Santa Inês, locally adapted breed, and Poll Dorset, specialized meat breed) for body measurements, growth to slaughter and carcass traits.

MATERIAL AND METHODS

A total of 48 male lambs from eight different genetic groups (6 lambs per group) were used: 50% East Friesian 50% Santa Inês (EFSI); 50% Primera 50% Santa Inês (PRSI); 50% Poll Dorset 50% Santa Inês (PDSI); 75% Poll Dorset 25% Santa Inês (75PDSI); 87.5% Poll Dorset 12.5% Santa Inês (87PDSI); 100% Santa Inês (SI); 50% Dorper 50% Poll Dorset (DOPD); 50% White Dorper 50% Poll Dorset (WDPD). The animals were housed soon after birth. The dams were let out to pasture during the day and stayed with the lambs at night. The lambs were fed Tifton 85 (*Cynodon* spp.) hay and concentrate ad libitum in creep-feeding from 5th day of life. Concentrate was based on corn, soybean and minerals, balanced according to the needs of animals with 21% crude protein.

Lambs were weaned at approximately 55 days of age and slaughtered at approximately four months of age (**Table I**). Feeding was carried out twice daily and reached 300g per animal per day at slaughter, which was when the animals reached approximately 30kg. Body measures before slaughter were withers height (WH), perimeter thoracic (PT), body length (BL), back bength (DL) and skin thickness (ST). Slaughter occurred after fasting for approximately 16 hours. The animals underwent atlanto-occipital desensitization, and then jugular veins and carotid arteries were sectioned for bleeding. The skin was removed and then an opening was made along the ventral midline for the removal of viscera. Immediately after evisceration, the whole carcass was identified and weighed.

Table I. **Means and standard deviation (SD) for birth weight (BW), weight at slaughter (SW), weaning weight (WW), weight gain from birth to weaning (GBW), weight gain from weaning to slaughter (GWS), weight gain from birth to slaughter (GBS), weaning and slaughter ages according to birth type and genetic groups** (Médias e desvio padrão (SD) do peso ao nascer (BW), peso ao abate (SW), peso a desmama (WW), ganho em peso do nascimento até a desmama (GBW), ganho em peso da desmama até o abate (GWS), ganho em peso do nascimento ao abate (GBS), idade ao desmame e idade ao abate de acordo com o tipo de nascimento e grupos genéticos).

	BW (kg)	WW (kg)	SW (kg)	GBW (kg.dia^{-1})	GWS (kg.dia^{-1})	GBS (kg.dia^{-1})	Weaning Age (days)	Slaughter Age (days)
Mean	4.20	16.44	31.20	0.222	0.248	0.235	54.79	117.46
CV (%)	17.89	17.92	3.77	21.42	24.89	15.61	14.87	17.55
Birth type								
Twin	4.14	15.97	30.74^{b}	0.212	0.255	0.233	55.17	116.42
Singletons	4.28	17.23	31.97^{a}	0.236	0.244	0.239	55.33	118.80
Genetic group								
SI	3.82	16.50	30.92	0.231	0.250	0.235	54.67^{ab}	121.17
EFSI	4.67	14.37	31.88	0.208	0.266	0.242	47.00^{b}	115.25
PRSI	4.23	13.63	32.25	0.181	0.265	0.229	51.50^{ab}	125.00
DOPD	4.29	18.50	31.06	0.228	0.279	0.249	63.88^{a}	108.88
WDPD	4.56	17.13	31.50	0.223	0.236	0.228	56.00^{ab}	122.88
PDSI	3.80	17.38	30.56	0.235	0.246	0.241	57.50^{ab}	112.50
75PDSI	4.52	18.17	31.33	0.226	0.216	0.222	59.33^{ab}	121.33
87PDSI	3.81	17.13	31.38	0.257	0.236	0.244	52.13^{ab}	113.88

Means followed by different letters per column differ statistically using Tukey test (P<0.05). EF: East Friesian, SI: Santa Inês; PR: Primera, PD: Poll Dorset; DO: Dorper, WD: White Dorper.

The carcasses were chilled at 4°C for 24 hours. After this period, cold carcass weight (CCW) and carcass length (CL) were recorded. The left side was sectioned into six commercial cuts, which were neck (NECK), belly (BEL), shoulder (SHO), leg (LEG), rib (RIB) and loin (LOIN), according to Silva Sobrinho (2001). The sections were weighed individually. Carcass yield was calculated by dividing cold carcass weight by slaughter weight. Proportions of commercial cuts were obtained dividing the weight of the cut by the cold carcass weight.

Data were analyzed using the Statistical Analysis System (SAS®) software. The weights (at birth, weaning and slaughter), weight gain (birth to weaning, weaning to slaughter and birth to slaughter) and ages (at weaning and at slaughter) were evaluated by analysis of variance (PROC GLM) considering the effect of genetic group and birth type (twin or singletons). The body measures (skin thickness, body and back length, perimeter thoracic and withers height) and carcass traits (weigh and proportional of commercial cuts) were submitted to analysis of variance to evaluate the effect of genetic group using the slaughter age as covariate, in order to correct to a possible bias due differences in slaughter age. Only when slaughter age represented a significant effect was shown. Least square means were compared between genetic groups using the Tukey test (p <0.05). Correlations (PROC CORR) and factor (PROC FACTOR) analyses also were carried out to verify the relation between variables.

Table II. **Means of skin thickness (ST), body (BL) and back length (DL), perimeter thoracic (PT) and withers height (WH) measured on animals of eight genetic groups of sheep reared in Midwest of Brazil** (Médias para espessura da pele (ST), comprimento do corpo (BL) e da garupa (DL), perímetro torácico (PT) e altura de cernelha (WH) mensurada em animais de oito grupos genéticos criados no Centro-Oeste brasileiro.)

Genetic Group	ST (cm)	BL (cm)	DL (cm)	PT (cm)	WH (cm)
SI	0.70^{bc}	55.90^{e}	44.34^{f}	68.85^{d}	60.51^{a}
EFSI	0.60^{c}	59.50^{d}	48.83^{d}	71.50^{c}	58.40^{b}
PRSI	0.57^{c}	59.64^{d}	45.82^{e}	73.70^{b}	60.91^{a}
DOPD	0.80^{ab}	62.00^{c}	46.16^{e}	78.16^{a}	57.50^{b}
WDPD	0.91^{a}	74.33^{a}	61.66^{a}	76.83^{a}	58.50^{b}
PDSI	0.68^{bc}	62.16^{c}	50.33^{c}	74.50^{b}	58.50^{b}
75PDSI	0.66^{bc}	68.00^{b}	54.00^{b}	75.00^{b}	59.20^{b}
87PDSI	0.67^{bc}	62.58^{c}	47.02^{e}	77.41^{a}	55.58^{c}
GG	***	***	***	***	***
Slaughter Age	ns	ns	***	ns	ns
Mean	0.70	62.96	49.75	74.49	58.37
CV (%)	17.49	6.44	6.36	3.47	5.53

Means followed by different letters per column differ by tukey test (P<0.05); *** P<0.0001, ** P<0.001, * P<0.05, ns: not significant; GG: genetic group, CV: coefficient of variation; PD: Poll Dorset; PR: First, EF: East Friesian, SI: Santa Inês, WD: White Dorper; DO: Dorper; EPE: thickness of hair coat; CC: body length, CD : length of the back; PT: heart girth, AC: withers height.

RESULTS

There was significant effect for birth type only on slaughter weight (**Table I**). Animals were weaned between 50 and 60 days of age and slaughtered at approximately 120 days of age. The genetic groups did not differ in any weight (at birth, at weaning and at slaughter), also did not differ in slaughter age.

Generally, Dorper x Pool Dorset crosses (DOPD) had thicker skin than Santa Inês crosses (**Table II**). The WDPD had the longest body and back length. DOPD, WDPD and 87PDSI had the largest perimeter thoracic. The SI had the lowest measure for all these traits. PRSI and SI had the highest withers height and 87PDSI was the shortest. Age to slaughter only affected back length.

Three genotypes consistently showed higher commercial cut weights, 87PDSI, 75PDSI and DOPD. In most cases, the SI and EFSI had inferior weights for commercial cuts. 87PDSI, WDPD and DOPD had the highest carcass yield (**Table III**). No differences were found between genetic groups for leg proportion but significant differences were found for proportions of other cuts (**Table IV**).

Carcass yield were negatively correlated with body measurements and slaughter weight, showing that as animals becomes bigger the carcass yield decrease (**Table V**). Correlations between weights were in general higher than 0.5, with the exception of correlation between neck and belly (0.42). Slaughter weight had medium correlations with most carcass traits and body measurements. Body measurements were poorly correlated with weight and age traits. As expected, an increase in one carcass trait was accompanied by an increase in other traits, as can be seen in principal factors (**Figure 1**). The neck was the trait that differed significantly from the others. The neck proportion was in opposite side to the proportion of the other cuts (**Figure 1**), which demonstrates that an increase in the proportion of the other cuts decrease the neck proportion. Body measurements had little influence on weight traits.

DISCUSSION

Birth type (single or twin) influence only the weight at slaughter, with difference of 1.23 kg. This result indicate that well fed ewes coupled with the introduction of creep feeding soon after birth can offset any limitations in mothering ability of ewes with twins. Higher percentages of twin births without loss in production levels should lead to more efficient and profitable production systems (Gomes et al. 2013). Schoeman et al. (1995) showed that ewes producing twins were 43% more efficient than those producing singles.

Santa Inês showed growth rates compatible with other crosses. The crossbred groups between Dorper, as sire, and Poll Dorset, as dam, did not differ in weaning weight, age at slaughter and carcass yield from crossbred groups between Poll Dorset, as sire, and Santa Inês, as dam (**Tables I** and **III**). These results highlights the potential of use Santa Inês as a dam line to crossbreeding.

Table III. Mean weights of leg (LEG), cold carcass (CCW), rib (RIB) , belly (BEL), loin (LOIN), neck (NECK) and shoulder (SHO), leg length (LLEG), leg diameter (DLEG), carcass length (CL), and carcass yield (CY) in eight genetic groups of sheep (Médias de peso de pernil (LEG), carcaça fria (CCW), costela (RIB), fralda (BEL), lombo (LOIN), pescoço (NECK) e paleta (SHO) e médias de comprimento de pernil (LLEG), diâmetro de pernil (DLEG), comprimento de carcaça (CL) e rendimento de carcaça (CY) em oito grupos genéticos de ovinos).

Genetic Group	LEG (kg)	LLEG (cm)	DLEG (cm)	CCW (kg)	CL (cm)	RIB (kg)	BEL (kg)	LOIN (kg)	NECK (kg)	SHO (kg)	CY (%)
SI	1.48^{d}	47.29^{d}	31.58^{d}	10.44^{e}	76.32^{b}	1.34^{d}	0.25^{e}	0.61^{c}	0.77^{e}	1.10^{e}	32.78^{d}
EFSI	1.56^{c}	49.16^{bc}	31.33^{d}	11.19^{d}	78.66^{a}	1.44^{c}	0.25^{e}	0.65^{c}	0.90^{c}	1.22^{d}	35.76^{c}
PRSI	1.63^{b}	48.91^{bc}	33.61^{c}	11.63^{dc}	79.88^{a}	1.52^{bc}	0.28^{d}	0.72^{b}	0.92^{bc}	1.25^{cd}	35.05^{c}
DOPD	1.78^{a}	47.50^{d}	35.83^{a}	12.52^{a}	77.16^{b}	1.66^{a}	0.32^{bc}	0.77^{a}	0.90^{bc}	1.29^{bc}	38.38^{ab}
WDPD	1.66^{b}	47.50^{d}	34.00^{c}	11.68^{dc}	76.33^{b}	1.51^{bc}	0.30^{cd}	0.71^{b}	0.86^{d}	1.30^{bc}	38.03^{ab}
PDSI	1.65^{b}	49.33^{b}	33.83^{c}	11.88^{bc}	80.33^{a}	1.60^{ab}	0.34^{b}	0.73^{ab}	0.94^{abc}	1.33^{ab}	36.49^{bc}
75PDSI	1.81^{a}	48.50^{c}	34.50^{bc}	12.76^{a}	79.16^{a}	1.56^{b}	0.37^{a}	0.73^{ab}	0.95^{ab}	1.38^{a}	36.56^{bc}
87PDSI	1.74^{a}	50.68^{a}	35.34^{ab}	12.35^{ab}	78.91^{a}	1.66^{a}	0.30^{dc}	0.70^{b}	0.96^{a}	1.32^{abc}	39.72^{a}

Means followed by different letters per column differ by Tukey test (P<0.05). PD: Poll Dorset; PR: Primera, EF: East Friesian, SI: Santa Inês, WD: White Dorper, DO: Dorper

Moreover, the leg weight was similar between DOPD, 75PDSI and 87PDSI. Thus, the use of crossbreeding between a specialized breed, as paternal, and a local genetic resource (Santa Inês), as maternal, can achieve the same production indices as a crossbreeding between two specialized breed (Dorper as paternal and Poll Dorset as maternal). Other studies also point to this manner of using local genetic resources. Vargas Junior et al. (2014; 2015) showed that Texel x Pantaneiro crosses were more efficient with a better feedlot performance, higher ribeye muscle area and better carcass characteristics with an adequate amount of fat cover. As no difference in production was seen between specialized and local breeds, probably there is a lack in environment adaptability when changing Santa Inês dams for those of specialized breeds.

Notter et al. (2004), as found here, showed that Dorper and Poll Dorset crosses have an important role in weight gain in crossbreds, thus improving the productive and reproductive efficiency in tropical environments. Both breeds are used extensively in other countries as terminal sires for meat production. However, it should be take care when choosing sire breed, as studies have shown that, depending on the system used, crossbreds are not necessarily better than purebreds (Paim et al. 2013).

The poor performance of East Friesian is expected as this is a milk breed, not usually recommended for terminal crosses (Gootwine & Goot 1996; Haenlein 2007). The East Friesian crossbreeding can improve milk production and prolifacy, yielding better dams. However, to support this concept, it is necessary to know the meat production of this cross. Therefore, this was the reason to evaluation of East Friesian cross in this study.

Primera is a composite breed developed for terminal sire use, nevertheless it showed worst results (low commercial cuts weight) than other breeds crossed with Santa Inês dams. The results here may be a consequence of the lack of adaptation of this New Zealand breed to Brazilian conditions.

Table IV. Effect of genetic group on proportions (%) of commercial cuts in the cold carcass of crossbred lambs (Efeito de grupo genético sob as proporções (%) dos cortes comerciais em relação a carcaça fria de cordeiros cruzados).

GG	%Rib	%Belly	%Loin	%Neck	%Shoulder	%Leg
SI	23.67^{ab}	4.62^{c}	10.59^{b}	14.08^{a}	20.92^{ab}	27.03
EFSI	24.20^{a}	4.97^{bc}	11.47^{a}	13.78^{b}	20.60^{ab}	27.21
PRSI	23.79^{ab}	4.95^{bc}	10.79^{ab}	13.87^{a}	20.09^{bc}	27.50
DOPD	25.19^{a}	4.95^{bc}	10.52^{b}	14.79^{a}	20.59^{ab}	27.60
WDPD	24.46^{a}	5.11^{bc}	11.35^{a}	13.61^{b}	19.63^{c}	27.45
PDSI	24.99^{a}	5.77^{a}	11.40^{a}	14.86^{a}	21.42^{a}	26.77
75PDSI	23.98^{a}	5.23^{b}	11.22^{ab}	13.94^{b}	21.21^{a}	27.52
87PDSI	22.51^{b}	5.87^{a}	10.50^{b}	13.88^{b}	20.72^{ab}	27.46

Means followed by different letters per column differ by Tukey test (P<0.05). PD: Poll Dorset; PR: Primera, EF: East Friesian, SI: Santa Inês, WD: White Dorper, DO: Dorper

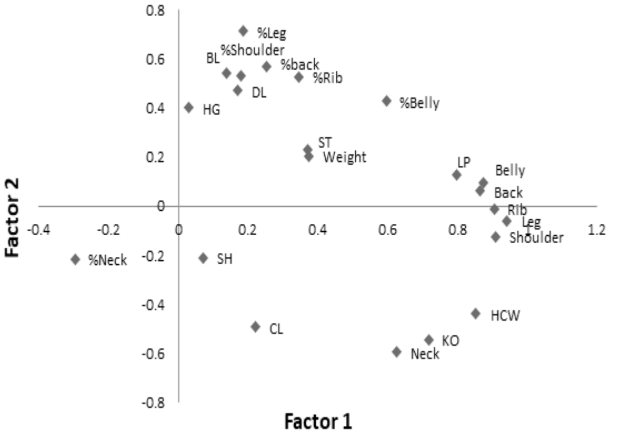

Figure 1. First two factors for carcass traits in crossbred sheep (Dois primeiros fatores para as características de carcaça em ovinos cruzados). SW: slaughter weight, BL: body length, DL: back length, HG: heart girth, SH: shoulder height, KO: carcass yield, CL: carcass length, ST: skin thickness, HCW: hot carcass weight, LD: leg diameter).

Table V. Significant correlations (p<0.05) between carcass traits in crossbred sheep (Correlações significativas entre características de carcaça em ovinos cruzados).

	CY	BL	DL	PT	WH	ST	CCW	CL	Rib	Belly	Back	Neck	Sho	Leg	DLeg	%Rib	%Belly	%Back	%Neck	%Sho	%Leg
BL	- 0.40***																				
DL	- 0.31***	0.84***																			
PT	- 0.48***	0.50***	0.23***																		
WH	.	.	0.12*	-0.24***																	
ST	.	0.26***	0.36***	0.23***	.																
CCW	0.58***	.	.	.	.	0.24***															
CL	0.17**	-0.36***	-0.33***	-0.22***	0.27***	.	0.25***														
Rib	0.30***	.	.	.	.	0.26***	0.75***	0.23***													
Belly	0.19**	.	0.19**	.	.	0.36***	0.69***		0.71***												
Back	0.22***	0.14*	.	.	0.17**	0.24***	0.69***	0.25***	0.75***	0.67***											
Neck	0.36***	-0.24***	-0.12*	-0.23***	0.24***		0.72***	0.53***	0.61***	0.42***	0.50***										
Sho	0.35***	.	0.18*	-0.12*	0.20***	0.29***	0.83***	0.28***	0.75***	0.71***	0.79***	0.67***									
Leg	0.34***	.	.	.	.	0.28***	0.86***	.	0.82***	0.78***	0.76***	0.57***	0.85***								
DLeg	0.25***	0.16**	.	.	-0.16**	0.25***	0.63***	.	0.71***	0.66***	0.63***	0.37***	0.59***	0.82***							
%Rib	-0.23***	.	.	.	.	.	.	.	0.60***	0.25***	0.32***	.	0.16**	0.21***	0.33***						
%Belly	.	0.20***	0.21***	0.12*	-0.13*	0.31***	0.25***	.	0.45***	0.87***	0.43***	.	0.40***	0.47***	0.47***	0.39***					
%Back	-0.30***	0.16**	.	0.14*	.	.	-0.15*	.	0.22***	0.16**	0.61***	-0.12*	0.18**	.	0.20**	0.52***	0.31***				
%Neck	-0.29***	-0.34***	-0.24***	-0.22***	0.15**	-0.22***	-0.34***	0.38***	-0.16**	-0.34***	-0.25***	0.40***	-0.20***	-0.35***	-0.32***	0.16**	-0.23***	.			
%Sho	-0.32***	.	0.22***	-0.13*	-0.16**	.	-0.21***	.	.	.	0.24***	.	0.38***	.	.	0.41***	0.29***	0.55***	0.21***	.	
%Leg	-0.41***	0.13*	.	.	-0.13*	.	-0.24***	-0.28***	0.15**	0.18**	0.15**	-0.26***	.	0.28***	0.38***	0.53***	0.41***	0.48***	.	0.57***	.
SW	-0.40***	0.47***	0.43***	0.42***	0.15*	0.17**	0.50***	.	0.49***	0.55***	0.51***	0.42***	0.54***	0.58***	0.42***	0.13*	0.37***	.	.	.	0.12*

. : correlation result not significant (p>0.05). *: 0.01>p<0.05, **: 0.001>p<0.01, ***: p<0.001, SW: slaughter weight, AS: age at slaughter, AW: age at weaning, BL: body length, DL: back length, PT: perimeter thoracic, WH: whiters height, CL: carcass length, CCW: cold carcass weight, ST: skin thickness, CY: carcass yield.

Carcass yield found here were relative low for all genetic groups. Other studies have shown carcass yield ranging from 37% to 50% (Vargas Junior et al. 2014) in crossbred lambs slaughtered at approximately the same weight (30kg). The former found that carcass yield improve with increased concentrate in the diet. The low levels found here might be due to the younger age of the lambs (in most papers lambs were slaughtered at six months to one year of age). Vargas Junior et al. (2015) found that the digestive system and its contents, as well as skin, head, legs, lungs with trachea, liver, heart, kidneys, spleen, internal and pelvic fat as well as testes and tail may represent up to 40% of live weight of sheep, being influenced by genetics, age, weight, sex, type of birth and, above all, feed (Oliveira, et al. 2013). Smith et al. (2001) also found that the skin and gastrointestinal content are factors that determine profit, as both may represent about 25% of live weight at slaughter.

Local genetic resources can have better reproductive performance than specialized breeds, due the higher environment adaptation (Getachew et al. 2013). Depending on the interaction between environmental conditions and exotic breed used, the lamb survivability can decrease or increase in relation to the local genetic resource (Getachew et al. 2015; Paim et al. 2013). Therefore, the use of crossbred dams must be careful evaluated. This study did not show great advantage of the crossbred dams. Therefore, the use of a local genetic resource (Santa Inês), as dam, and a meat specialized breed, as sire, seems to be thea good alternative for production systems in Brazilian savannah.

CONCLUSIONS

Three genotypes consistently showed higher commercial cut weights and highest carcass yield, 87PRSI, 75PDSI and DOPD. Therefore, these genetic groups are options for use in intensive lamb production systems in central Brazil. The use of Santa Inês, a locally adapted hair breed, as maternal breed in crossbreeding system showed similar results to using Poll Dorset, a meat specialized breed, in relation to live weight production. It highlights how to introduce a local genetic resource in intensive system without decrease the system yield and providing better environment adapted dams.

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