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SHORT NOTE

Post-weaning growth of pure and crossbred hair lambs under the tropical Mexican conditions

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SUMMARY

The study evaluated the post-weaning growth of pure and crossbred hair lambs under the tropical conditions of the southeast of México. Data from 323 male lambs of six distinct breed groups (Dorper, Katahdin, Pelibuey, Dorper × Katahdin, Dorper × Pelibuey and Katahdin × Pelibuey) were analyzed. The dataset considered the post-weaning average daily weight gain (ADG) and final body weight adjusted to 60 (P60) and 90 (P90) days of fattening. The statistical model included the fixed effects of breed group and two seasons of the year (Dry: January-May and Rainy: June-September). The initial body weight was included as co-variable. Breed group was a significant source of variation for all the traits (P≤0.01), but the season of the year had no effect on any variable evaluated (P>0.05). Dorper × Katahdin crossbred lambs had a better post-weaning growth than the other breed group. Under the conditions of this study, genetic factors had a greater influence on the post-weaning growth of hair lambs than the non-genetic factors.

Additional keywords

Pelibuey.
Dorper.
Katahdin.
Season of the year.
Fattening systems.

Crecimiento post-destete de corderos de pelo puros y cruzados bajo condiciones del trópico Mexicano

RESUMEN

El estudio evaluó el crecimiento post-destete de corderos de pelo puros y cruzados bajo condiciones del trópico mexicano. Se analizaron 323 datos de corderos de seis grupos raciales distintos (Dorper, Katahdin, Pelibuey, Dorper × Katahdin, Dorper × Pelibuey y Katahdin × Pelibuey). El conjunto de datos consideró las ganancias diarias de peso post-destete (GDP) y pesos al finalizado ajustados a 60 (P60) y 90 (90) días de engorda. El modelo estadístico incluyó los efectos fijos del grupo racial y de dos épocas del año (Secas: Enero a mayo y Lluvias: junio a septiembre). El peso inicial fue incluido como co-variable. El grupo racial fue una fuente importante de variación para todas las características (P≤0,01), pero la época del año no tuvo efecto sobre ninguna variable evaluada (P> 0,05). El grupo racial Dorper × Katahdin tuvo un mejor crecimiento post-destete que los otros grupos raciales. Bajo las condiciones de este estudio, los factores genéticos tuvieron una mayor influencia sobre el crecimiento post-destete de los corderos de pelo que los factores no genéticos.

Palabras clave adicionales

Pelibuey.
Dorper.
Katahdin.
Época del año.
Sistemas de engorde.

Information

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INTRODUCTION

The use of locally adapted breeds and their crosses with specialized breeds for meat production is a common practice in many regions of Mexico (Muñoz-Osorio et al. 2016, p. 271). In this sense, breed effects have been reported on the productive performance of lambs fattening under various climatic conditions (Partida et al. 2009, p. 316; Macías-Cruz et al. 2010, p. 150; Vázquez et al. 2011, p. 251; Ríos et al. 2011, p. 276; Hinojosa-Cuéllar et al. 2013, p. 137), but under conditions of sub-humid tropics, information is limited and contradictory (Bores et al. 2002, p. 74; Canton et al. 2009, p. 28; Magaña-Monforte et al. 2015, p. 6,). In addition, studies on genetic resources regarding their productive capacity in differents seasons of the year are limited (Hinojosa-Cuéllar et al. 2013,

p. 137; Galaviz-Rodríguez et al. 2014, p. 1306). Research on the ability of different genotypes to reach the market weight, during a different season of the year is important to establish the better sheep breeds and their crosses that meet the specific production and market objectives (Álvarez et al. 2013, p. 10). Therefore, the aim of this study was to determine the post-weaning growth of pure and crossbred hair lambs in feedlot under the tropical Mexican conditions.

MATERIAL AND METHODS

The production data of 323 male-lambs were collected at a farm during the year 2012. The sheep farm was located in Yucatan, Mexico (20° 29' north latitude and 89°43' west longitude, with an altitude of 30 m above sea level). The climate is warm and humid with summer rains (AW0). The annual rainfall is around 1,034 mm, with peaks of rainfall between July and September. The maximum and minimum annual average relative humidity is 78% and 73%, respectively (INEGI 2011). The maximum and minimum annual average temperature are 17°C (January) and 36° C (May), respectively (CONAGUA 2013).

The animals were pure breed (Pelibuey, Dorper, and Katahdin) and crosses (Dorper × Katahdin, Dorper x Pelibuey and Katahdin × Pelibuey). At weaning (initial day of the fattening period), all lambs were ear-tagged, weaning dates and body weight were recorded and housed in groups of 16 animals on raised slatted floor cages. Pen size was 9 m^2 and stocking density was 0.56 m^2 per lamb. The height of pen from ground level was 80 cm. The pens provided roof, feeders, and troughs. The animals were fed *ad libitum* with commercial pellet concentrate and fresh water. The commercial concentrate contained 12 % humidity, 14.5 % crude protein, 2.8 % fat, 3.1 % crude fiber, 5.0 % ashes and 62.60 % nitrogen-free extractives (according to manufacturer). Additionally, all lambs received *Cynodon nlemfluensis*, *Brachiaria brizantha* or *Zea mays* hay as a supplement. There were not available data on feed intake; then feed conversion was no estimated. At the beginning of the fattening period, all lambs were drenched against parasite infection and vaccinated against *pneumonic pasteurellosis*.

Data of initial body weight (IBW), final body weight (FBW), and dates of beginnings (DB) and endings (DE) of the fattening period were recorded. Due to missing data for birth dates, the age of lambs at beginning of the fattening period was not calculated. Lamb fattening period (LFP) was calculated as the difference between DE and DB and average daily weigh gain (ADG) as the difference between FBW and IBW divided by LFP. The FBW was adjusted to 60 (P60) and 90 (P90) post-weaning days, using the following formulae:

$$P60 = ADG*60d + IBW$$

$$P90 = ADG*90d + IBW$$

Where:

ADG, average daily weight gain

d, day of adjustment

IBW, initial body weight

(Hinojosa et al. 2013, p. 136; Muñoz-Osorio et al. 2017, p. 385).

According to the climatic conditions of the region (INEGI 2013), there are three seasons in the year: dry (Feb to May), rainy (June to September), and cold (October to January), when the animals were fattened. For the study, only dry and rainy seasons were considered due to the limited data number during the cold season.

The data were analyzed by analysis of variance. The model included the fixed effect of breed group and season of the year on the ADG, P60, and P90. Simple interactions between fixed effect (breed and season of the year) were included in the preliminary model; however, it was not significant and was removed from the final model. The IBW was included in the model as a covariate to adjust the differences in the initial weight of the animals that may be biased by differences in age and litter size at birth (Magaña-Monforte et al. 2015, p. 6 p. 4). Differences between means were determined by Tukey test. The data were analyzed by GLM procedure of SAS version 8 (SAS 1999).

RESULTS

The overall means for ADG, P60, and P90 were 325 g, 34 kg, and 44 kg, respectively. The least squares means and standard errors for ADG, P60, and P90 of the lambs, according to breed group and season of the year are showed in **Table I**. The breed group presented an effect on all variables evaluated ($P \leq 0.01$). The post-weaning growth of Dorper × Katahdin lambs was greater compared with the other breed groups ($P \leq 0.01$). On the other hand, the lowest post-weaning growth was for Pelibuey lambs ($P<0.05$). There were no differences between Dorper and Dorper × Pelibuey lambs ($P>0.05$; **Table I**). However, Dorper, Dorper × Pelibuey, Katahdin and Katahdin × Pelibuey lambs had a similar post-weaning growth ($P>0.05$; **Table I**). Season of the year had no effect on any of variables evaluated ($P>0.05$; **Table I**).

DISCUSSION

The results show that Dorper × Katahdin lambs had superior post-weaning growth compared with the other groups evaluated. Similarly to our study, Magaña-Monforte et al. (2015, p. 6 p. 4) reported that the post-weaning growth for Katahdin × Dorper lambs was higher than both Katahdin and Katahdin × Pelibuey lambs. One possible explanation is that Dorper and Katahdin breeds and their F1 crosses achieve faster its reach earlier mature body weight (Magaña-Monforte et

Table I. Least squares means and standard errors (LSM ± SE) for daily weight gain (ADG) and final body weight adjusted at 60 (P60) and 90 (P90) days post-weaning of lambs according to breed group and season of the year in the sub-humid tropic of Mexico (Medias de mínimos cuadrados y error estándar (MMC ± EE) para la ganancia diaria de peso (GDP) y pesos al finalizado ajustados a 60 (P60) y 90 (P90) días post-destete de corderos de acuerdo al grupo racial y a la época del año en el tropicop subhúmedo de México).

Fixed effects	N	ADG, g	P60, kg	P90, days
		LSM ± SE	LSM ± SE	LSM ± SE
Breed group				
Pelibuey	59	285.1 ± 6.4[c]	32.2 ± 0.3[c]	40.8 ± 0.5[c]
Dorper	33	313.4 ± 9.0[bc]	33.9 ± 0.5[bc]	43.3 ± 0.8[bc]
Katahdin	61	329.7 ± 6.3[b]	34.9 ± 0.3[b]	44.8 ± 0.5[b]
Dorper × Pelibuey	17	304.3 ± 11.9[bc]	33.4 ± 0.7[bc]	42.5 ± 1.0[bc]
Katahdin × Pelibuey	66	310.9 ± 6.1[b]	33.8 ± 0.3[b]	43.1 ± 0.5[b]
Dorper × Katahdin	87	377.8 ± 5.6[a]	37.8 ± 0.3[a]	49.2 ± 0.5[a]
Season of the year				
Rainy	102	325.2 ± 5.8[a]	34.7 ± 0.3[a]	44.4 ± 0.5[a]
Dry	221	315.2 ± 3.9[a]	34.1 ± 0.2[a]	43.5 ± 0.3[a]

[abc]Least squares means with a common superscript in the same column are not significantly different (P>0.05).

al. 2015, p. 6) and accumulate more body fat at a younger age compared to other breeds (Partida and Martínez 2010, p. 185; Vázquez et al. 2011, p. 252).

The superiority in the crossbred animals could be due to the effect of the hybrid vigor that occurs in F1 generation between crosses of two different breeds (De Vargas Junior et al. 2014, p. 874). However, there are reports showing not such effect (Canton et al. 2009, p. 28; Vázquez et al. 2011, p. 251), as observed in our study, with the Dorper × Pelibuey and Katahdin × Pelibuey lambs that had a similar post-weaning growth that Dorper and Katahdin lambs. Thus, these differences may be due to the effect of type of crossing between different sire and dam, which may show the effect of the hybrid vigor and may come from the effect of the plane of nutrition (Abdullah et al. 2010, p. 170). Macías-Cruz et al. (2010, p. 150) and Rios et al. (2011, p. 276) reported that crossbreeding different genotypes would significantly affect the post-weaning growth.

There were no effect of season of the year on the post-weaning growth lambs. Similar results were reported by Muñoz-Osorio et al. (2016, p. 386). This may be due at the tolerance and environmental adaptation of hair lambs, attributed to their phenotypic characteristics (hair density, layer height and length of hair) that favor the development of mechanisms of thermal regulation (Do Prado et al. 2013, p. 60; Correa et al. 2013, p. 1409). Under the conditions of this study, genetic factors had a greater influence on the post-weaning growth of hair lambs in feedlot than the non-genetic factors. However, it is suggested to evaluate the cold season, due to apparently, the hair sheep are negatively affected by cold weather, because they might use more energy for keeping body temperature .

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