Growth and feed conversion efficiency of Dorper and Rambouillet lambs

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ABSTRACT: Data from Dorper and Rambouillet ram lambs (n = 79) were used to estimate breed means for postweaning growth rate, feed intake, feed conversion efficiency (kilograms of gain divided by kilograms of feed consumed), and residual feed intake on a high concentrate diet during the typical age and weight range for U.S. lamb production. Lambs were progeny of 6 unrelated sires/breed and were born over a 2-yr period. Dams of the lambs were a representative sample of Dorper ewes in the United States and Rambouillet ewes in Texas. Data were analyzed using SAS PROC MIXED with a model that included year, breed, birth type, and feeder pen as fixed effects and sire as a random effect. The mean BW at the start of the feeding trial was 31.4 ± 3.7 kg at a mean age of 92.7 ± 9.2 d. Electronic feeders were used to record individual animal feed intake. Growth rate and feed intake were measured for 77 d during the postweaning growth period. Mean ADG was 340 ± 9.2 g for Dorper lambs and 346 ± 8.6 g for Rambouillet lambs. The mean final bodyweight was 58.1 ± 4.8 kg when the mean age was 170 d. Average daily feed intake was 2,223 ± 50 g for Dorper lambs and 2,215 ± 48 g for Rambouillet lambs. Feed conversion efficiency was 0.153 ± 0.003 for Dorper lambs and 0.158 ± 0.003 for Rambouillet lambs. No significant differences were observed between Dorper and Rambouillet lambs for weaning weight, postweaning gain, final weight, feed intake, feed conversion efficiency, or residual feed intake. Growth rate, feed intake, and feed conversion efficiency were similar for Dorper and Rambouillet ram lambs fed from a mean of 31 kg BW and 93 d of age to a mean BW of 58 kg and a mean age of 170 d.

Key words: feed conversion, Dorper, Rambouillet, residual feed intake


INTRODUCTION

Many of the lambs in the United States are finished in a feedlot, where they are typically fed high energy diets of harvested feeds. Growth rate and feed conversion efficiency are economically important traits in lamb feeding enterprises. Information about breed differences for postweaning feedlot performance can be used by producers when choosing which breed to raise or when determining value of feeder lambs.

The Rambouillet has historically been the predominant sheep breed in Texas and much of the western United States. The Rambouillet is a dual-purpose breed, raised for wool production and lamb production. Low wool income and increasing labor costs during the 1980s and 1990s have resulted in interest from U.S. sheep producers in eliminating shearing costs by switching to non-wool breeds for lamb production (Notter, 2000). The Dorper is a non-wool breed and does not require shearing. Dorper sheep were imported into the United States in the mid 1990s because of their reported performance (Cloete et al., 2000) in arid conditions. Production factors other than shearing costs and wool income must be considered in a comprehensive evaluation of the differences between Dorper and Rambouillet. Growth rate and feed conversion efficiency during the postweaning feeding phase are important production traits. The relative importance of feed conversion efficiency increases with the cost of feed. A direct comparison of Dorper and Rambouillet for various aspects of production is needed so that producers can make an informed choice among breeds. No reports of a comparison between Dorper and Rambouillet lambs for postweaning growth rate and feed

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conversion efficiency on a high energy feedlot finishing diet were found.

The objective of this study was to estimate the difference in postweaning growth rate, feed intake, feed conversion efficiency, and residual feed intake between Dorper and Rambouillet ram lambs.

**MATERIALS AND METHODS**

All procedures involving animals were approved by the Texas A&M University Institutional Agricultural Animal Care and Use Committee under protocol 2008-294.

**Animals**

From 2003 through 2005, approximately 100 Dorper ewe lambs (7/8 or more Dorper ancestry) were acquired from 20 flocks from 10 different states: Oregon, South Dakota, Minnesota, Iowa, Missouri, Ohio, Kentucky, Oklahoma, Arizona, and Texas. Approximately 100 Rambouillet ewe lambs were acquired from 13 Texas flocks. The flock was assembled so as to be a representative sample of the breeds available at the time. All ewes were maintained together by Texas A&M AgriLife Research at a ranch in Edwards County, TX, from May through December each year. Ewes were mated in August and September to produce lambs in the spring in an annual lambing system. All ewes were moved to the Texas A&M AgriLife Research Center at San Angelo, TX, in January before lambing. Ewes returned to the ranch in Edwards County after lambs were weaned in April. To produce the lambs for the current study, ewes were mated to purebred sires of their respective breeds in single-sire breeding pastures from mid August to late September in 2008 and 2009. All ewes were between 4 and 7 yr of age when raising the lambs for this study. Ewes were randomly assigned to a service sire. Three unrelated rams per breed were used as sires each year, resulting in lambs from 6 sires/breed. Lambs were born in January and February of 2009 and 2010. Lambs were identified with their dam and ear tagged within 14 h of birth. Lambs were docked at the distal end of the caudal fold and vaccinated with a *Clostridium perfringens* types C and D and tetanus vaccine at 1 or 2 d of age. Ewes and lambs were moved to mixing pens when lambs were 2 to 5 d old. Ewes and lambs were moved to oat fields when lambs were approximately 2 wk of age and remained there until weaning. Lambs were vaccinated for contagious ecthyma at approximately 6 wk of age. Lambs were weaned in mid April of 2009 and 2010. A second *Clostridium perfringens* types C and D and tetanus vaccination was given at weaning.

Intact male lambs were used in this study. After weaning, lambs were blocked by weaning weight and assigned to 1 of 5 feeding pens. Feeding pens were 4.6 by 9.0 m. Half of the pen was covered so that lambs had access to shade. Ten lambs were assigned to each pen. Both breeds were represented in each of the pens. Lambs were fed a commercially prepared pelleted ration (16% CP and 3.12 Mcal/kg ME).

**Feed Recording**

Each feeding pen contained Feed Intake Recording Equipment (FIRE; Osborne Industries, Inc., Osborne, KS). The feeders operated by recognizing individual lambs via an ear tag transponder, which carried a unique electronic identification. The FIRE feeders consisted of a feed trough, a load cell, and receiving equipment to identify the radio signal from the tag transponder carried by the lambs. These electronic feeders were equipped with a protective crate, or race, that only allowed 1 lamb to eat at a time. This crate was at the entrance of the feeder and protected lambs on all sides except the rear. When a lamb entered a feeder, the time, the weight of the feed trough, lamb identification number, and feeder number were recorded. Upon exiting the feeder, weight of the feed trough and time were recorded again. The shape of the feed trough was such that feed spillage was minimized. The amount of wasted feed was deemed negligible. The number of lambs per feeder was chosen so that feed intake would not be limited by feeder availability (Jenkins and Leymaster, 1987). The data were stored electronically at the feeder until it was downloaded to a computer daily. Thus, feed intake was measured on an individual basis. The individual lambs were weighed approximately every 2 wk.

Lambs were allowed an adaptation period of 20 d in 2009 and 13 d in 2010 in order for the lambs to become accustomed to the feed and feeders. During this time the lambs’ feed intake was recorded and monitored but not used in analyses. Lambs were removed from the pens if they did not learn to use the electronic feeders or for health problems. After the adaptation period, BW was recorded as the starting weight for the trial. Lambs were fed and feed intake recorded for 77 d. Data from 2 pens of lambs (1 pen in each year) were removed from the analysis because of feeder malfunctions that resulted in incomplete or questionable feed intake records on lambs in those pens. There were 39 Dorper lambs and 40 Rambouillet lambs with complete data. Average daily gain was calculated over the 77-d feeding period as (final weight – start weight)/days on feed. Average daily feed intake was calculated as the total feed consumed (as-fed basis) divided by the days on feed. Feed conversion efficiency (FCE) was calculated as the total weight gained divided by the feed consumed during the feeding period.
results and discussion

Table 1 shows the means and variation for the performance measures for all lambs in both years. The age and weight range of the postweaning feeding period in this study was close to the typical range for commercial U.S. lamb feeding operations. The mean final weight of 58.1 kg in the current study was close to the average weight of lambs slaughtered under federal inspection in the United States of 62 kg in 2010 and 64 kg in 2011 (USDA, 2012). The mean ADFI for the 77-d postweaning feeding period of 2,211 g/d was 4.9% of the average BW. Considerable variation was observed in the ADFI. The lamb with the highest ADFI consumed 34% more than the mean. The lamb with lowest ADFI consumed 24% less than the mean. The range in ADFI was 1,295 g/d. The range is RFI was 924 g/d or 71% of the range of ADFI.

In the mixed model analysis, year was a significant source of variation for weaning weight, start weight, ADFI, and FCE. Even though the management was similar in the 2 yr, weather and other environmental factors contributed to year differences. Type of birth was significant for weaning weight and start weight. As lambs got older, the single-born lambs no longer had a weight advantage.

Least squares means by breed are shown in Table 2. Breed was not a significant source of variation for any of the traits analyzed (P > 0.2). Dorper and Rambouillet lambs exhibited similar performance for weaning weight, start weight, final weight, and ADG. Dorper and Rambouillet lambs also had similar ADFI, FCE, and RFI. Start weight was a significant source of variation for ADFI and FCE. The estimate of the regression coefficient of ADFI on start weight was 40 ± 14 g/kg. The estimate of the regression coefficient of FCE on start weight was –0.003 ± 0.001/kg. The negative regression coefficient indicates that the lambs with heavier start weight had lower FCE. Breed estimates were changed little by the inclusion of the covariate. The inclusion of start weight as a covariate reduced the residual variance, but breed differences were not significant with either model.
The Rambouillet ram lambs in this study gained 346 g/d with ad libitum feeding. The Rambouillet ram lambs in the study of Jackson et al. (1997) were also fed ad libitum and gained 350 g/d, which was similar to the 346 g/d for Rambouillet rams in the present study (Table 2). The Rambouillet ram lambs in the study of Notter et al. (1984) gained considerably less (197 g/d) due to being on restricted feed.

Postweaning ADG for Dorper ram lambs was 340 g/d, which was greater than the 239 g/d reported for Dorper-Columbia wether lambs by Snowder and Duckett (2003). The Dorper-Columbia lambs in that study were weaned at an older age and started the postweaning trial at 50 kg, which was considerably heavier than the lambs of the current study that started the postweaning gain trial at 32 kg. Notter et al. (2004) reported postweaning ADG of 142 g for Dorper-cross wether lambs on a high concentrate diet. Schoeman (2000) reported pen-fed Dorper lambs gaining 297 g/d from birth to 14 wk. No reports were found of Dorper lambs gaining as much as in the current study. However, the present study used intact ram lambs and a high concentrate diet with no grazing during the postweaning growth phase. Therefore, the gains would be expected to be greater than when lambs had a lower energy diet. The gains of the current study were less than the 418 g/d reported by Notter et al. (1984) for their Dorper-Columbia wether lambs, which had a final weight of 65 kg. Consideration of these studies together suggests that FCE is dependent on the age and weight range as was concluded by Notter et al. (1984). When start weight was used as a covariate in the FCE model in the present study, the estimated regression coefficient was negative and significantly different from zero. The lower FCE reported by Snowder and Duckett (2003) also indicates that FCE may decrease as lambs get closer to their mature weight. The Dorper and Rambouillet lambs in the current study were of similar mean age and weight. Therefore, the comparison is valid for this range, but results may differ if a different endpoint is chosen.

Additional information is needed for a comprehensive evaluation of Dorper and Rambouillet feeder lambs. Breed differences in carcass composition or value may exist. Pelt value is another factor that may result in an economic difference. The current study was designed and conducted to represent a typical age and weight range of slaughter lambs in the United States. Feeding lambs to heavier weights may have resulted in a different conclusion. Dorper and Rambouillet ram lambs had similar growth rate, ADFI, FCE, and RFI from weaning to a mean slaughter weight of approximately 58 kg. Therefore, these 2 breeds are not significantly different for postweaning growth and feed conversion.

**LITERATURE CITED**


