ABSTRACT #M463

COMPARISON OF TEXAS RAMBOUILLET SHEEP AND AUSTRALIAN MERINO F1 CROSSES

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INTRODUCTION

Rambouillet (R) sheep in the United States are raised for lamb, wool, and hides. Long-term selection of Merino (M) sheep in Australia has resulted in numerous types having a broad range of production characteristics. Our specific interest is in a type of smooth-bodied M that is capable of producing significantly more and finer wool than the R while concurrently weaning a comparable quantity of lamb under western rangeland conditions. The majority of previously reported U.S. research with Rambouillet sheep (and most other breeds) has focused on improving lamb production with less emphasis on wool quality or quantity. To benefit from such improvements, it has generally been necessary to increase inputs into the production system, typically increased nutrition and management. When nutrition and labor are limited (as is often the case in extensive production systems in Texas and the western range states), such approaches are not always economically or practically feasible. Significant negative changes have impacted sheep production during the past 20 yr including lower prices for wool and hides, stagnant domestic demand for lamb meat, higher labor costs, lack of labor, and increasing predator losses, to name a few. Consequently, wool and lamb production and the number of sheep operations have declined. We are investigating a crossbreeding approach for increasing income from Rambouillet-type sheep that is designed to increase wool production and value without decreasing lamb production or increasing inputs. Thus the objectives of this study are to estimate the differences in wool production and value and lamb production and value between R and M X R crosses.

Table 1. Target traits for sires used in the study.					
Trait	Merino	Rambouillet			
Clean wool production, kg/yr	> 8	> 5			
Average fiber diameter, µm	< 19	21.0 - 22.5			
Mature bodyweight, kg	115	115			

Must be smooth bodied

Table 1 Target traits for sires used in the study

Body folds/wrinkles

Over 3 breeding seasons, 10 selected and unrelated M sires and 11 R rams were used to breed ~330 commercial R ewes (3-7 yr of age, BW = 61.5 ± 6.9 kg, average fiber diameter [AFD] = 21.3 ± 2.1 µm) per year for a total of 994 couplings. Semen from Australian M sires (n = 6) was purchased from 4 studs (Hyfield [1], Keri-Keri [2], Leahcim [2], and Wallaloo Park [1]). The US Merinos (n = 2) and Merino X Rambouillet cross rams (n = 2) were purchased from Rafter 7 Ranch, Nevada. Of the 11 Rambouillet sires used, 9 were from Texas Rambouillet Superior Genetics (TRSG), one from Angelo State University flock, and one from Landers Ranch, TX. Nine of the rams had better than average index values on the Sonora Central Ram Performance Test. Two were half sibs and 3 were sons of sires used earlier in the study. Traits targeted in selection of the rams are listed in Table 1. Rams used in this evaluation were purposefully selected not to be representative of their breed as a whole. The M sires had finer wool and smoother bodies than most Merinos and the R rams were more productive (in terms of wool production, average fineness and variability, staple length, and weight gain combined) than average rams.

Laparoscopic artificial insemination (LAI) was used to produce offspring from the 6 Australian Merino sires and natural, single-sire matings were used with the remaining M and R rams (Table 2). Ewes were exposed to rams 3 wk before and 3 wk after LAI in an attempt to produce lambs of similar average age to those produced with LAI. In year 1, lambs were born and raised under range conditions and paternity was confirmed with DNA analysis of blood. Due to severe predator losses, ewes were shed-lambed in subsequent years, returning to the range when the lambs were ~10 wk of age. Ram lambs were left intact and, like the ewe lambs, were raised on the range, supplementation being provided during the winter months. Bodyweights were obtained on all offspring at irregular intervals. Fleeces were shorn in April (representing 16 mo and 12 mo of growth for year 1 offspring and 12 mo for year 2 lambs). Grease fleece weights (GFW) were recorded and fleeces were evaluated for lab scoured yield (LSY), clean fleece weight (CFW), AFD, average fiber curvature (AFC), comfort factor (CF), and average staple length (ASL). Ewes born in year 1 of the study (M X R crosses

Table 2. Number of ewes exposed, sires used, sonogram results, and lambs raised to 10 wk of age

Month ewes exposed	Number of ewes exposed (number of sires used)		-	regnant by 10gram, %	Live lambs at 10 wk of age, % of ewes exposed	
	LAI	Natural	LAI	Natural	LAI	Natural
June, 2007; pasture lambed	187 (5)	115 (4)	75	84	25	38
October 2008; shed lambed	219 (3)	129 (4)	52	81	44	73
October 2009; shed lambed	69 (5)	114 (4 M) 161 (4 R)	87	92	64	90

EXPERIMENTAL PROCEDURE

and contemporary R) were exposed to R rams as 2-yr-olds to evaluate lamb production. Data were analyzed using PROC MIXED of SAS. The model included fixed effects of genotype and sex, a random effect of sire within genotype, and age of lambs as a covariate when it was available (for lambs born in years 2 and 3 of the study).

Sonogram results for years 1-3 are summarized in Table 2. The large discrepancy in year 1 between sonogram-determined pregnancies and live lambs at ~10 weeks of age was attributed primarily to predation. The smaller differences in subsequent years were pre- and peri-natal losses. Least squares means of some of the traits measured or calculated to date are shown in Tables 3 - 5. Body weights of M X R and R sheep were similar (Table 3). For the 2007-born sheep, LSY, ASL, and CFW per unit of body weight were greater for the M X R compared to the R sheep. Conversely, AFD and AFC were smaller. Preliminary indication (2010 GFW) for the 2009-born lambs is that wool production by the M crosses is greater than their R contemporaries.

One set of lambs has been weaned from the ewes born in the fall of 2007. Number of lambs born and weaned are presented in Table 5.



Figure 1. Finewool ewes on summer range in western Texas.

RESULTS

Table 3. Body weights of 2007 fall- and 2009 and 2010 spring-born lambs

	MXR(n)	R (n)	Р
Body weight, kg			
2007-born lambs			
6 mo, all	27.8 (47)	29.3 (44)	0.348
10 mo, all	44.0 (47)	48.6 (44)	0.035
2 yr, males only	71.2 (20)	75.7 (21)	0.139
2009-born lambs			
2 mo, all	18.5 (96)	18.1 (94)	0.675
5 mo, males only	26.7 (48)	24.8 (46)	0.211
11 mo, males only	42.9 (48)	43.4 (46)	0.781
14 mo, females only	37.7 (35)	39.3 (30)	0.287

Table 4. Fleece and fiber characteristics

Tres:4	Genotype			Sex			
Trait	MXR	R	Р	Female	Male	P	
2007-born lambs							
16-mo whole fleece	(n = 45)	(n = 40)		(n = 43)	(n = 42)		
GFW, kg	4.3	4.1	0.543	4.1	4.2	0.509	
LSY, %	60.8^{a}	56.3 ^b	0.005	57.9	59.1	0.119	
CFW, kg	2.6	2.3	0.119	2.4	2.5	0.239	
CW/BW, g/kg	58.8 ^a	48.0 ^b	0.012	57.7 ^a	49.1 ^b	0.001	
AFD, μm	17.8 ^b	18.7^{a}	0.015	18.6 ^a	17.9 ^b	0.012	
ASL, cm	12.0	11.4	0.429	12.0	11.4	0.077	
AFC, deg/mm	87.2 ^b	95.5 ^a	0.019	90.7	92.0	0.519	
CF, %	99.7 ^a	99.5 ^b	0.010	99.5 ^b	99.7 ^a	0.006	
12-mo whole fleece							
GFW, kg	4.3	4.0	0.129	3.8	4.5	< 0.001	
2009-born lambs							
12-mo whole fleece	(n = 83)	(n = 77)		(n = 65)	(n = 94)		
GFW, kg	3.1 ^a	2.7 ^b	0.015	2.7 ^b	3.2 ^a	< 0.001	
12-mo side sample							
AFD, µm	17.8 ^b	19.0 ^a	0.010	18.5	18.4	0.561	
ASL, cm	6.8 ^a	5.9 ^b	0.003	6.4	6.3	0.824	
AFC, deg/mm	72.9 ^b	90.0 ^a	0.005	80.4	82.5	0.287	
CF, %	99.9	99.5	0.093	99.7	_	-	

^{a, b} Within genotype or sex and within a row, means without a common superscript differ (P < 0.05). Key to abbreviations: GFW = grease fleece weight; LSY = lab scoured yield; CFW = clean fleece weight; CW/BW = clean wool production per unit of body weight; AFD = average fiber diameter; ASL = average staple length; AFC = average fiber curvature; CF = comfort factor (% fibers < or = to 30 μ m).

Table 5. Number of lambs born and weaned and weaning weights for ewes born in fall 2007

Trait –	Genotype				
	MXR	R	Р		
	(n = 18)	(n = 24)			
Lambs born	0.875	1.111	0.254		
Lambs weaned	0.834	0.999	0.402		

APPLICATION

A strategy is being evaluated that was designed to produce M X R crossbred sheep capable of growing significantly more and finer wool than their dams without additional inputs or decreased lamb production. If successful, this strategy should be of interest to range producers of fine-wool sheep. Evaluated as yearlings in 2009, the M X R sheep from highly selected Australian M rams produced a similar amount of wool as their R contemporaries. However, the M X R wool was finer and in a range that had a significant effect on value in the US marketing system. Sales price plus Loan Deficiency Payment on 5-14-09 was \$11.62 versus \$7.45/kg clean. Over the next 2 years, crossbred ewes and contemporary Rambouillets will be further evaluated for wool and lamb production and males will be evaluated for wool production, gain, and possibly meat characteristics.