

Evaluating the Effect of South African Meat Merino Breeding on Pre- and Post-Weaning Growth, Feedlot Performance, Carcass Traits, and Wool Characteristics

R. M. Knuth¹, W. C. Stewart², J. A. Boles¹, C. M. Page², A. F. Williams¹, and T. W. Murphy^{1*}

¹Department of Animal and Range Sciences, Montana State University, Bozeman 59717 and

²Department of Animal Science, University of Wyoming, Laramie 82071

IMPACT STATEMENT

The South African Meat Merino is a relatively new addition to the U.S. sheep industry and has not been extensively compared to breeds commonly used in Western sheep production. Results from the present study indicate that weaning weight and carcass characteristics were similar between purebred Rambouillet and South African Meat Merino x Rambouillet lambs. However, Rambouillet sired ewes were heavier as yearlings and had lower MFD than South African Meat Merino sired ewes. These results should be interpreted judiciously as a preliminary component of a multi-year study. Future research evaluating lifetime lamb and wool production of South African Meat Merino cross ewes is ongoing with this project.

SUMMARY

The South African Meat Merino (SAMM) is a dual-purpose breed whose selection has focused on lamb and wool production. However, little is known about its ability to enhance these economically important traits in Western sheep production. The objectives of this study were to compare pre- and post-weaning growth, feedlot performance, carcass traits, and fleece characteristics of sheep reared by Rambouillet dams and sired by either Rambouillet, Suffolk, or SAMM rams. Rambouillet sired lambs were 0.4 lbs lighter ($P = 0.04$) at birth than SAMM sired lambs in 2016. In 2017, Suffolk sired lambs were 0.7 and 1.8 lbs heavier ($P \leq 0.01$) at birth than SAMM and Rambouillet sired lambs, respectively, which were not different ($P = 0.12$). No differences ($P \geq 0.38$) in 120 d body weight were observed among sire breeds in either year. The same sire breeds were compared in an 89 d wether feeding trial, and no differences ($P \geq 0.25$) were observed in body weight at the end of the trial or average daily gain and feed conversion ratio throughout the trial. However, Suffolk sired wethers had a higher dressing percentage and heavier leg and loin weights ($P \leq 0.01$) than Rambouillet and SAMM sired wethers, which were not different ($P \geq 0.12$). A

portion of Rambouillet and SAMM sired ewe lambs were kept as replacements to the breeding flock. Rambouillet sired ewes were 9 lbs heavier ($P < 0.01$) as yearlings than SAMM sired ewes. Ewes were shorn at 1 and 2 yr of age and sire breed had no effect ($P \geq 0.40$) on greasy fleece weight or CV of fiber diameter. However, mid-side wool samples of SAMM sired ewes were 2.1 μm coarser in mean fiber diameter ($P = 0.04$) than Rambouillet sired ewes.

INTRODUCTION

Between 2010 and 2015, wool sales represented 6.5 to 13% and lamb sales 76 to 83% of the annual returns to a typical Western rangeland sheep operation (LMIC, 2016). An economically sound breeding program should focus on improving lamb production traits while maintaining wool quality. Mating Western white-faced ewes (e.g., Rambouillet, Targhee) to terminal sire breeds (e.g., Suffolk, Hampshire) has improved lamb pre- and post-weaning growth (Leeds et al., 2012; Notter et al., 2012) and carcass characteristics (Mousel et al., 2012; 2013). However, fleece quality is significantly reduced in these crossbred lambs (Scales et al., 2000) and resulting ewe lambs are not typically kept as replacements. A white-faced, dual-

purpose sire breed that can improve lamb traits without large sacrifices in wool quality would be beneficial to the Western sheep industry.

Selection in the South African Meat Merino (SAMM) has emphasized lamb and wool production (Neser et al., 2000; Cloete et al., 2004b). Cloete and Durand (2000) reported that SAMM x Merino lambs were heavier at birth and weaning but had lighter clean fleece weight, shorter staple length, and higher mean fiber diameter as yearlings than purebred Merinos. The SAMM is a relatively new addition to the U.S. with few purebred flocks and research reports (Meyerhoff et al., 2017). Therefore, the objectives of this study were to compare pre- and post-weaning growth, feedlot performance, carcass traits, and fleece characteristics of sheep reared by Rambouillet dams and sired by either Rambouillet, Suffolk, or SAMM rams.

PROCEDURES

The Montana State University (MSU) Agricultural Animal Care and Use Committee approved all husbandry practices and experimental procedures used in this study. Commercial Rambouillet ewes were exposed to either Rambouillet (n = 5), SAMM (n = 5), or Suffolk rams (n = 2) in November 2015 and 2016 and lambs were born in April of the following years. In both production years, ewes and lambs were managed on native rangeland until weaning.

Approximately 3 mo after weaning in 2016, Rambouillet (n = 10), Suffolk (n = 10), and SAMM (n = 10) sired wethers with a similar body weight (BW) across genotype were placed in a single drylot pen (129 m x 21 m) equipped with four GrowSafe bunks (GrowSafe Systems Ltd., Airdrie, AB, Canada). Lambs were adapted to the GrowSafe bunks and trial diet (15.1% crude protein, 61.6% total digestible nutrients) for 10 d and fed *ad libitum* thereafter. Fasted BW was collected on consecutive days at the start and end of the 89 d feeding trial. Wethers were harvested following the feeding trial.

Rambouillet and SAMM sired replacement ewe lambs were selected at weaning in 2016 and 2017 and managed with the adult ewe flock thereafter. Body weight was collected on 2016 born Rambouillet and SAMM sired ewes at approximately 12 mo of age. Greasy fleece weight (GFW) and mid-side wool samples were collected at shearing (February 2018) on 2016 and 2017 born Rambouillet (n = 45) and SAMM sired (n = 37) replacement ewes. Fiber metrology traits of side samples were analyzed at the MSU Wool Laboratory on an Optical-based Fiber Diameter Analyser 2000.

Statistical Analyses

Lamb BW at birth (n = 405) and 120 d (n = 305) was analyzed within year procedure with fixed effects of sire breed, sex, dam age (2, 3, or 4+ yr), and birth or rear type (single or multiple) and the random effects of dam and sire. In the

Table 1. Least-squares means (\pm SE) for the main effects of birth type (BT) or rear type (RT), sex, age of dam, and sire breed on lamb body weight (BW) at birth and 120 d in the 2016 and 2017 production years.

Effect	Level	2016		2017	
		Birth BW, lbs	120 d BW, lbs	Birth BW, lbs	120 d BW, lbs
BT, RT ¹	1	11.9 \pm 0.22 ^a	67.7 \pm 1.54 ^a	12.8 \pm 0.27 ^a	78.0 \pm 1.61 ^a
	2+	9.7 \pm 0.18 ^b	52.7 \pm 1.79 ^b	10.4 \pm 0.24 ^b	59.3 \pm 1.68 ^b
Sex	Ewe	10.4 \pm 0.18 ^b	58.4 \pm 1.70	11.0 \pm 0.22 ^b	67.2 \pm 1.52
	Wether	11.0 \pm 0.18 ^a	61.7 \pm 1.63	12.1 \pm 0.24 ^a	70.1 \pm 1.65
Age of dam, yr	2	11.0 \pm 0.40	60.2 \pm 3.79	11.0 \pm 0.40	66.6 \pm 2.36
	3	10.4 \pm 0.18	59.3 \pm 1.46	12.3 \pm 0.44	67.2 \pm 5.97
	4+	10.6 \pm 0.15	61.1 \pm 1.08	11.2 \pm 0.20	67.2 \pm 1.32
Sire breed ²	Rambouillet	10.6 \pm 0.15 ^b	60.4 \pm 1.54	10.8 \pm 0.26 ^b	68.3 \pm 1.96
	SAMM	11.0 \pm 0.15 ^a	59.7 \pm 1.79	11.5 \pm 0.33 ^b	67.0 \pm 2.05
	Suffolk	-	-	12.6 \pm 0.33 ^a	70.8 \pm 2.49

¹BT, RT= observed birth type for birth BW or rear type at for 120 d BW.

²Lambs sired by either Rambouillet, South African Meat Merino (SAMM), or Suffolk rams and raised by Rambouillet ewes.

^{a,b}Means within an effect and column are different ($P < 0.05$).

2015 breeding season, Rambouillet ewes were exposed to Suffolk rams in multiple sire groups, therefore, sire identification was not available in 2016 born Suffolk cross lambs and they were not included in the 2016 analysis.

Feedlot lamb BW at the start and end of the trial, average daily gain (ADG), feed conversion ratio (FCR), and carcass characteristics were separately analyzed with the effect of sire breed. Carcass characteristics included: dressing percentage (DP), loin, leg, and rack weights, back fat depth (BF), and loin eye area (LEA). Yearling BW and lamb and yearling GFW, mean fiber diameter (MFD), and CV of fiber diameter (CV-FD) were analyzed separately with the fixed effect of sire breed and the random effect of sire.

RESULTS AND DISCUSSION

Pre-weaning Performance

Least-squares means for the main effects of birth or rear type, sex, age of dam, and sire breed on lamb BW at birth and 120 d in 2016 and 2017 are displayed in Table 1. Not surprisingly, single born/reared lambs were heavier at birth and 120 d ($P < 0.001$) than multiple born/reared lambs in both years. Males were heavier ($P < 0.001$) at birth than females in both years but sex had no effect ($P \geq 0.08$) on 120 d BW in either year. Age of dam did not affect ($P \geq 0.12$) lamb BW at birth or 120 d in either year.

In 2016, SAMM sired lambs were 0.4 lbs heavier ($P = 0.04$) at birth than Rambouillet sired lambs. Suffolk sired lambs born in 2017 were 1.8 and 0.7 kg heavier at birth ($P \leq 0.01$) than Rambouillet and SAMM sired lambs, respectively, which were not different ($P = 0.12$). However, sire breed had no effect ($P \geq 0.38$) on 120 d BW in either year. Cloete and Durand (2000) reported that lambs sired by SAMM rams and reared by Merino ewes were 0.68 and 9.04 lbs heavier at birth and 140 d, respectively, than purebred Merino lambs.

Feedlot Performance and Carcass Characteristics

Least-squares means for the main effect of sire breed on feedlot performance and carcass characteristics are presented in Table 2. Sire breed had no effect on BW at the start or end of the trial, ADG, or FCR ($P \geq 0.25$). Meyerhoff et al. (2017) reported similar results where no difference in BW gain or feed efficiency was observed between purebred and crossbred Rambouillet rams of varying (25-50%) SAMM breeding.

Suffolk sired lambs had the greatest DP (53.7%; $P \leq 0.001$), but DP of Rambouillet (50.0%) and SAMM sired (51.2%) lambs was not different ($P = 0.12$). Suffolk sired lambs also had the heaviest ($P \leq 0.01$) loin (6.86 lbs) and leg weights (12.2 lbs), but these were not different ($P \geq 0.52$) between Rambouillet (6.17 and 10.8 lbs,

Table 2. Least-squares means (\pm SE) for the main effect of sire breed on feedlot performance and carcass characteristics.

Trait ²	Sire Breed ¹		
	Rambouillet	SAMM	Suffolk
Start BW, lbs	86.0 \pm 1.59	85.3 \pm 1.59	87.5 \pm 1.59
End BW, lbs	134.0 \pm 2.34	132.9 \pm 2.34	138.2 \pm 2.34
ADG, lbs d ⁻¹	0.56 \pm 0.02	0.53 \pm 0.02	0.57 \pm 0.02
FCR	10.6 \pm 0.37	10.7 \pm 0.37	10.3 \pm 0.37
DP, %	50.0 \pm 0.51 ^b	51.2 \pm 0.48 ^b	53.7 \pm 0.48 ^a
Leg, lbs	10.8 \pm 0.24 ^b	11.0 \pm 0.24 ^b	12.2 \pm 0.24 ^a
Loin, lbs	6.17 \pm 0.18 ^b	6.13 \pm 0.18 ^b	6.86 \pm 0.18 ^a
Rack, lbs	5.78 \pm 0.13	5.60 \pm 0.13	5.91 \pm 0.13
LEA, in ²	2.36 \pm 0.06	2.43 \pm 0.06	2.54 \pm 0.06

¹Lambs sired by either Rambouillet, South African Meat Merino (SAMM), or Suffolk rams and raised by Rambouillet ewes.

²Start BW = BW at the start of the trial; End BW = BW at the end of the trial; ADG = average daily gain; FCR = feed conversion ratio; DP = dressing percentage; Leg, Loin, and Rack = weight of leg, loin, and rack, respectively; LEA = loin eye area.

^{a,b}Sire breed means within a trait are different ($P < 0.05$).

respectively) and SAMM sired lambs (6.13 and 11.0 lbs, respectively). No difference ($P = 0.28$) in rack weight was observed among sire breeds. Cloete et al. (2008) compared carcass characteristics of terminally sired lambs reared by either purebred SAMM or SAMM x Merino dams and found that while shoulder weight increased with proportion of SAMM breeding, hindquarter and loin weight did not.

Wool Characteristics and Yearling BW

Least-squares means for the main effects of age of ewe and sire breed on wool characteristics are displayed in Table 3. Two-yr-old ewes had heavier GFW, coarser MFD, and lower CV-FD ($P \leq 0.005$) than 1-yr-old ewes. Mid-side wool samples of SAMM sired ewes were 2.1 μm coarser ($P = 0.04$) than Rambouillet sired ewes, but sire breed did not influence GFW or CV-FD ($P \geq 0.40$). Cloete and Durand (2000) reported that SAMM x Merino ewes had 1.79 lbs lighter yearling GFW and 1.5 μm coarser MFD than purebred Merino ewes but did not differ in CV-FD. In the present study, Rambouillet sired ewes were heavier (100.5 lbs; $P < 0.001$) as yearlings than SAMM sired ewes (91.5 lbs). In contrast, Cloete and Durand (2000) reported that SAMM x Merino yearling ewes were 24.3 lbs heavier than purebred Merino yearling ewes.

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Table 3. Least-squares means (\pm SE) for the main effects of sire breed and ewe age on yearling greasy fleece weight (GFW), mean fiber diameter (MFD), and CV of fiber diameter (CF-FD).

	Level	Trait		
		GFW, lbs	MFD, μm	CV-FD, %
Sire breed ¹	Rambouillet	4.41 \pm 0.13	19.9 \pm 0.38 ^b	17.6 \pm 0.44
	SAMM	4.41 \pm 0.13	22.0 \pm 0.40 ^a	17.0 \pm 0.46
Age of ewe, yr	1	3.09 \pm 0.13 ^b	19.7 \pm 0.32 ^b	17.9 \pm 0.38 ^a
	2	5.95 \pm 0.13 ^a	22.2 \pm 0.40 ^a	16.6 \pm 0.40 ^b

¹Ewes sired by either Rambouillet or South African Meat Merino (SAMM) and raised by Rambouillet ewes.

^{a,b}Means within an effect and column are different ($P < 0.05$).

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*Corresponding author email:
thomas.murphy12@montana.edu