

# INTROGRESSION OF THE FEC<sup>B</sup> ALLELE OF THE BOORoola MERINO INTO A RAMBOUILLET FLOCK

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The Booroola Merino is a highly prolific strain of medium-wooled non-Peppin Australian Merino which has been extensively studied and evaluated worldwide. Their exceptional reproductive performance is due to a single major autosomal allele, presently denoted as Fec<sup>B</sup>.

A project to introgress the Fec<sup>B</sup> allele into a Rambouillet flock was initiated at the Dixon Springs Agricultural Center of the University of Illinois in 1985, and the project was moved to the Arlington Agricultural Research Station of the University of Wisconsin-Madison in 1991. This report presents results obtained at the Wisconsin site from the autumn of 1991 through the autumn of 1994.

Rambouillet and homozygous (Fec<sup>BB</sup>) Booroola Merino rams initially were mated to the flock of Rambouillet ewes. Booroola Merino-cross female progeny from this mating and subsequent matings were backcrossed to Rambouillet rams, and only BM-cross females expected to be heterozygous (Fec<sup>B+</sup>) were retained as replacements. The same Rambouillet rams were mated with the Rambouillet and BM-cross ewes. Lambs were weaned at approximately 60 days of age. Rambouillet replacement ewes were selected on estimated genetic merit for litter size. Ewes were mated in order to lamb first at approximately 2 years of age and annually thereafter. Prior to breeding each year, ovulation rate of ewes was determined by counting number of corpora lutea with a

laparoscope. Booroola Merino-cross ewes were classed as carriers (Fec<sup>B+</sup>) if they had 3 or more ovulations at their first examination at approximately 19 months of age.

The presence of the Fec<sup>B</sup> allele resulted in higher ovulation rates (Table 1). Booroola Merino breeding decreased ewe breeding weight, but the decrease was 12.8 lb. less for the 1/4BM ewes than for the 1/2BM ewes. Condition scores also were decreased as a result of Booroola Merino breeding. There were no significant differences among genotypes for fleece weight.

The higher ovulation rates of the Fec<sup>B</sup> carriers resulted in a significantly higher number of lambs born per ewe compared to the Rambouillet ewes (Table 1). However, the difference was greatly reduced by weaning due to differences in lamb survival favoring the Rambouillet ewes. The higher prolificacy of the Fec<sup>B+</sup> genotype also resulted in decreased lamb weaning weights. However, the higher prolificacy compensated for the poorer lamb performance as there was no significant difference among genotypes for weight of lamb weaned per ewe exposed (ewe productivity).

It is obvious that the potential for improved lamb production by the introgression of the Fec<sup>B</sup> allele will only be realized if the base breed has superior mothering ability and milk production to ensure reasonable survival and growth of the additional lambs. Unfortunately, these early data do not

indicate increased lamb production at the time of weaning from the introgression of the Fec<sup>B</sup> allele into this Rambouillet population. However, a final conclusion will depend upon the comparative

performance of higher percentage Rambouillets (7/8 and 15/16 Rambouillet with the Fec<sup>B</sup> allele) and purebred Rambouillets.

Table 1. Prebreeding Traits, Fleece Weight and Ewe Productivity at 60 Days After Lambing

Breeding	Number of ewes		No. of obs.	No. of ovulations	Breeding weight (lb)	Condition score	Fleece weight (lb)
<u>Data set 1</u>							
Rambouillet	42	125		2.20±0.08	173.2±1.9	3.6±0.1	10.0±0.2
1/2R-1/2BM	19	53		3.93±0.12	133.1±3.0	3.3±0.1	10.0±0.3
(Fec <sup>B+</sup> )							
Difference				-1.73***	40.1***	0.3***	-0.0
<u>Data set 2</u>							
Rambouillet	80	183		2.10±0.06	159.9±1.6	3.6±0.1	10.3±0.2
3/4R-1/4BM	37	85		3.30±0.09	132.6±2.1	3.4±0.1	9.6±0.3
(Fec <sup>B+</sup> )							
Difference				-1.20***	27.3***	0.2***	0.7
<u>Data set 3</u>							
Rambouillet	34	53		1.89±0.08a			
7/8R Fec <sup>++</sup>	12	15		1.94±0.17a			
7/8R Fec <sup>B+</sup>	14	19		3.19±0.14b			
3/4R Fec <sup>++</sup>	12	19		1.79±0.14a			
3/4R Fec <sup>B+</sup>	12	15		3.13±0.16b			

abp < .01

Breeding	Number of ewes		Fertility (%)	Prolificacy (no.)	Lamb survival (%)	Lamb Wn. Wt. (lb)	Ewe Prod. (lb per ewe)
<u>Data set 1</u>							
Rambouillet	41	96	100	1.96±0.08	93.2±2.5	50.2±0.7	90.0±3.5
1/2R-1/2BM	16	39	100	2.58±0.13	81.9±3.1	38.9±0.9	82.9±5.3
(Fec <sup>B+</sup> )							
Difference			0	-0.62***	11.3***	11.3***	7.1
<u>Data set 2</u>							
Rambouillet	65	112	94.1±2.1	1.76±0.07	96.8±2.7	49.5±0.7	77.2±3.1
3/4R-1/4BM	27	53	97.7±3.2	2.50±0.10	82.3±4.2	38.9±1.1	74.1±4.6
(Fec <sup>B+</sup> )							
Difference			-3.6	-0.74***	14.5***	10.6***	3.1

\*\*\* P<.01

Lamb production of the ewes in data set 1 and 2 was evaluated at 120 days after lambing, and results are presented in Table 2. Ewe numbers, fertility and prolificacy are the same as those presented in Table 1. While there were still no significant

differences between Rambouillet and R-BM crosses for ewe productivity at 120 days after lambing, the 3/4R-1/4BM ewes did have a higher mean value than their contemporary Rambouillet ewes.

Table 2. Ewe Productivity at 120 Days After Lambing

At 120 days after lambing			
Breeding	Lamb survival, %	Lamb wt., lb	Ewe productivity, lb lamb/ewe
Rambouillet	91.9±.03	85.2±1.0	146.1±6.0
1/2R-1/2BM (Fec <sup>B+</sup> )	79.4±.03	68.6±1.3	136.3±9.2
Difference	12.5***	16.6***	9.8
Rambouillet	95.5±.03	84.2±1.0	130.7±5.8
3/4R-1/4BM (Fec <sup>B+</sup> )	82.2±.04	69.1±1.7	132.7±8.9
Difference	13.3***	15.1***	-2.0

\*\*\*P < .01

Prior to shearing in the spring of 1994, midside fleece samples were taken from all 119 mature and yearling ewes in the population. Samples were sent to the Texas A&M Wool and Mohair Laboratory at San Angelo and analyzed for clean yield and fiber diameter by Dr. Chris Lupton and his

staff. Results are presented in Table 3. Both R-BM crosses had higher yielding fleeces than Rambouillet ewes, and 3/4R-1/4BM ewes tended to have coarser fleeces than Rambouillet ewes, especially 3/4R-1/4BM Fec<sup>B+</sup> ewes.

Table 3. Fleece Traits

Breeding	No.	Clean yield, %	Fiber diameter, μm	Fiber diameter, std. dev.
Rambouillet	24	55.7±.7 <sup>b</sup>	22.1±.3	4.9±.1
1/2R-1/2BM (Fec <sup>B+</sup> )	12	58.6±.9 <sup>a</sup>	22.3±.5	4.9±.1
Rambouillet	45	57.9±.5 <sup>b</sup>	22.6±.2 <sup>b</sup>	4.8±.1
3/4R-1/4BM (Fec <sup>++</sup> )	15	59.9±.9 <sup>a</sup>	22.8±.4 <sup>ab</sup>	5.0±.1
3/4R-1/4BM (Fec <sup>B+</sup> )	23	61.2±.9 <sup>a</sup>	23.6±.4 <sup>a</sup>	5.0±.1

<sup>ab</sup>P < .05, among contemporary group within a column.