
VOLUME 62 2002

Effect of incorporating East Friesian genes on wool characteristics

T. C. REID[1] AND J. BOOKER[2]

[1] Wool Research Organisation of New Zealand (Inc.), Private Bag 4749, Christchurch.

ABSTRACT

A study carried out on eight farms examined the effect of crossing the present flock (Corriedale or Romney) with East Friesians. Crossing East Friesian over Corriedales increased fibre diameter from 28.5±0.1 µm to 31.7±0.2 µm compared with straightbred Corriedales. Inclusion of up to $^3/_4$ East Friesian breeding over Romneys reduced the fibre diameter from 36.3±0.4 µm to 31.4±1.3 µm compared with straightbred Romneys. The effect on bulk of crossing East Friesians over Corriedale was variable. Based on an average wool price of 500c/kg clean for 28 µm Corriedale hogget fleece wool between 94/95 and 98/99, a change of 3.0 µm is likely to reduce the expected wool price by approximately 7%. Based on an average wool price of 400 c/kg clean for 36 µm Romney hogget fleece wool, a change of 4.0 µm is likely to increase the expected wool price by approximately 13%.

Keywords: fibre diameter; core bulk; medullation, fibre curvature; East Friesian; Corriedale; Romney.

INTRODUCTION

Current price relativities between meat and wool encourage farmers to focus on increasing ewe fertility and lamb growth rate, potentially at the expense of wool. With the introduction of the East Friesian breed into New Zealand sheep breeding in the last few years, there has been considerable interest in the ability of this breed to enhance the lamb production of our traditional breeds. This has been noticeable in the drier areas of the Eastern South Island where Corriedales have been traditionally run.

Reduced wool weight by 10%, with slight decrease in fibre diameter and increase in bulk with East Friesian X Romney crosses compared with Border Leicester X Romney was reported by Allison (1995). Another study (Bray, 1999) showed that crossing Romneys with East Friesians reduced the fibre diameter by 5.3 µm and increased bulk by 3 cm^3/g. However, little other information is available on the effect of the use of the East Friesian on wool production and wool properties, especially on medium micron wools produced by Corriedales.

This project was aimed at providing data on the wool properties and production of East Friesian X Corriedale and East Friesian X Romney crosses.

METHODS

Farmers who had used rams with East Friesian blood over Corriedales or Romneys were asked to provide either data on wool production and properties or wool samples for measurement. A total of 574 samples were received from seven farmers and wool and live weight data were obtained for 384 animals from one additional farmer.

The wool samples were measured for yield, fibre diameter (mean and coefficient of variation (CV)), medullation and fibre curvature. Wool bulk was predicted for all samples using an equation developed in earlier WRONZ studies (Maddever, pers. comm.):

Predicted bulk = -12.8 + 0.34 * Curvature + 0.52 * Fibre diameter (R^2 = 76%)

TABLE 1. East Friesian crossing systems studied

Farm	Ewe breeds	Ram breeds	Crosses sampled	Ages sampled
1	Corriedale EF/Corriedale East Friesian	East Friesian EF/Corriedale	Corriedale $^1/_4$ East Friesian $^1/_2$ East Friesian East Friesian	Hogget, 2th,4th
2	Corriedale	EF/Corriedale	Corriedale $^1/_4$ East Friesian	Hogget
3	Corriedale	EF/Corriedale	Corriedale $^1/_4$ East Friesian	
4	Corriedale EF/Corriedale	East Friesian EF/Corriedale Corriedale	Corriedale $^1/_4$ East Friesian $^1/_2$ East Friesian $^3/_4$ East Friesian	Hogget
5	Romney	East Friesian	Romney $^1/_2$ East Friesian	Hogget
6	Romney EF/Romney	East Friesian $^1/_2$ East Friesian $^1/_4$ East Friesian	$^1/_2$ East Friesian $^3/_4$ East Friesian $^7/_8$ East Friesian East Friesian	Hogget
7	Romney	East Friesian $^1/_2$East Friesian	Romney $^1/_2$ East Friesian $^1/_4$ East Friesian	4th
8	Romney	East Friesian	Romney $^1/_2$ East Friesian	Hogget

[2]"Longfield", 386 Dalmany Rd, Hawarden

TABLE 2. Least-square mean (±sem) wool processing properties for East Friesian x Corriedale sheep.

		Corriedale	$^{1}/_{4}$ EF	$^{1}/_{2}$ EF	$^{3}/_{4}$ EF	EF	Breed
Number		360	105	165	32	19	
Yield (%)		71.3±0.2	70.8±0.7	75.9±0.3	74.8±0.8	73.3±1.9	**
Fibre diameter	Mean (µm)	28.5±0.1	29.5±0.2	31.7±0.2	31.4±0.4	31.9±0.9	**
	CV (%)	21.8±0.1	22.6±0.3	22.8±0.2	22.9±0.5	20.4±1.0	*
Fibre curvature (°/mm)		68.6±0.7	68.4±1.4	60.1±0.9	55.9±1.7	63.5±3.1	**
Bulk (cm^3/g) [1]		24.0±0.2	25.2±0.3	23.7±0.2	21.9±0.3	24.4±0.6	**
Medullation (%)		1.0±0.1	1.0±0.2	0.9±0.1	0.9±0.3	0.7±0.5	ns
Clean fleece weight (kg)[2]		3.30±0.02	3.09±0.06	3.15±0.05	2.90±0.14		**

1. Bulk predicted from fibre diameter and curvature
2. Clean fleece weight available from hoggets on one farm only.

Information on the ewe and ram breeds on each of the farms and on the crosses and ages and numbers of animals sampled is given in Table 1.

For each parent breed and its crosses with East Friesians the data were analysed by a model using farm, breed and year born as fixed effects. The least-square means for each breed and cross represented on more than one farm were then predicted from this model. These least-square means were then used to calculate breed means and heterosis values using the model Genup (Kinghorn, 2000).

RESULTS AND DISCUSSION

The data, corrected for farm, sex and age where necessary, are presented in Tables 2 and 3.

Effect on Wool Properties and Production

Where the base breed was Corriedale, inclusion of $^{1}/_{2}$ or $^{3}/_{4}$ East Friesian genes increased mean fibre diameter by up to 3 µm (Table 2) – similar to the pure East Friesians sampled. With $^{1}/_{4}$ East Friesian breeding the fibre diameter increase was 1 µm. Increasing East Friesian breeding up to $^{3}/_{4}$ resulted in increasing variability of fibre diameter as expressed by the coefficient of variation (CV) and decreasing fibre curvature. As a consequence of these changes, the effect of increasing East Friesian breeding on bulk was variable. Inclusion of East Friesians had no effect on medullation. On the one farm where data were available, hogget clean fleece weight decreased with increasing East Friesian breeding, with $^{3}/_{4}$ East Friesians producing 0.40 kg/head (12%) less than the Corriedales.

Where the ewe breed was Romney, inclusion of more than $^{1}/_{4}$ East Friesian resulted in decreasing mean fibre diameter and increasing fibre diameter CV (Table 3). Fibre curvature increased with increasing East Friesian breeding, but the effect on bulk was small and variable. Inclusion of East Friesians decreased medullation. There was no effect on hogget greasy fleece weight on the one farm on which the data were available.

The East Friesian could not be considered a breed that would reliably increase wool bulk.

Effect on Price

Based on the average price over the last five years (1994/95 to 1998/99, inclusive), increases in fibre diameter when Corriedales were crossed with East Friesians would result in decreased price of 6 to 7%. Any reductions in wool weight, such as the 6% reduction in clean fleece weight with $^{1}/_{4}$ East Friesian $^{3}/_{4}$ Corriedales (Table 2), would compound the reductions in price resulting from crossing East Friesians with Corriedales.

The effects on fibre diameter with $^{1}/_{2}$ to $^{3}/_{4}$ East Friesian crosses with Romneys are likely to increase price by 13-14%.

For either parent breed, the small changes in bulk from the inclusion of East Friesian breeding are unlikely to affect price.

The effect of these changes in the returns from wool must be weighed against the reputed increases in liveweight gain of progeny resulting from the inclusion of East Friesian breeding. On one farm, the increases in live weight were 1.6 and 1.6 kg in autumn and 2.7 and 6.1 kg in spring for $^{1}/_{2}$ and $^{3}/_{4}$ East Friesians, respectively, compared with pure Corriedale flock mates.

Heterosis Values

The breed means and heterosis values for each trait are given in Table 4. For the East Friesian X Corriedale crosses, the heterosis values for most traits were positive and less than 5%, except for curvature and predicted bulk, where the heterosis values were negative.

The heterosis for fibre diameter ranged from –3.8 to

TABLE 3: Least-square mean (±sem) wool processing properties for East Friesian x Romney sheep.

		Romney	$^{1}/_{4}$ EF	$^{1}/_{2}$ EF	$^{3}/_{4}$ EF	$^{7}/_{8}$ EF	Breed significance
Number		124	48	48	35	5	
Fibre diameter	Mean (µm)	36.3±0.4	36.5±0.5	32.3±0.4	31.4±1.3	29.8±1.6	**
	CV (%)	23.0±0.4	22.5±0.5	24.5±0.4	24.7±1.3	25.7±1.6	*
Fibre curvature	(°/mm)	43.7±1.0	46.2±1.2	52.8±1.0	52.1±3.2	59.6±3.9	**
Bulk (cm^3/g)[1]		22.1±0.2	22.9±0.3	22.0±0.2	21.3±0.7	22.1±0.8	**
Medullation (%)		2.0±0.3	1.5±0.3	0.8±0.3	0.7±0.9	0.6±1.0	*
Greasy fleece weight (kg)[2]		3.29±0.08	3.43±0.07		ns		

1. Bulk predicted from fibre diameter and curvature
2. Greasy fleece weight available from hoggets on one farm only.

TABLE 4: Breed means and heterosis values for traits from breeds crossed with East Friesians. Heterosis expressed as absolute values and as percentages.

a. Corriedale crosses

Trait		**Breed means**		**Heterosis**	
		East Friesian	**Corriedale**	**Value**	**%**
Yield (%)		78.3	69.1	2.46	3.3
Fibre diameter	Mean (µm)	32.8	28.0	1.47	4.8
	CV (%)	21.9	21.9	0.89	4.1
Medullation (%)		0.74	1.11	0.02	2.2
Curvature (°/mm)		60.9	70.4	-5.72	-8.7
Bulk (cm^3/g)[1]		24.1	26.2	-1.15	-4.6

b. Romney crosses

Trait		**Breed means**		**Heterosis**	
		East Friesian	**Romney**	**Value**	**%**
Fibre diameter	Mean (µm)	31.1	37.0	-1.29	-3.8
	CV (%)	25.1	22.7	0.29	1.2
Medullation (%)		0.90	2.07	-0.72	-48.3
Curvature (°/mm)		57.6	43.1	0.70	1.4
Bulk (cm^3/g)[1]		26.4	23.7	-0.38	-1.5

+4.8% for Romney and Corriedale crosses, respectively. For CV of diameter the range was 1.2 to 4.1%. Large negative heterosis values were derived for medullation for the crosses with Romneys. Relatively high negative values were derived for heterosis for Corriedale crosses for both curvature and predicted bulk, whereas for Romney crosses, these heterosis values were both similar in size (approximately 1.5%), but opposite in sign.

CONCLUSIONS

The use of East Friesians for crossing over traditional sheep breeds in New Zealand would increase fibre diameter in medium micron breeds and decrease it in strong-wooled breeds. The effect on bulk would be small and variable and there may be a reduction in fleece weight. These effects are likely to reduce the wool income from medium micron breeds but may increase it in crossbred flocks if the reduction in wool weight was small. Any reductions in wool income must be compensated for by increases in lamb production and lamb growth rates.

ACKNOWLEDGEMENTS

This study was funded by a grant from the FITT fund from Wool*Pro* and Meat New Zealand. The eight farmers who willingly provided samples and data are thanked. Mr R A Urquhart carried out much of the sample measurement.

REFERENCES

Allison, A. J. 1995: Importing a sheep which offers more. – The East Friesian. *Proceedings of the New Zealand Society of Animal Production 55:* 321-323.

Bray, A. R. 1999: Hogget wool traits of sheep breeds used for crossbreeding with strong wool breeds – preliminary estimates from research studies. *Proceedings of the New Zealand Society of Animal Production 59:* 17-18.

Kinghorn, B. P. 2000: The genetics of crossbreeding. *In:* Kinghorn, B. P.; van der Werf J.; Ryan M. *eds.* Animal Breeding. Use of New Technologies. Post Graduate Foundation in Veterinarian Science of the University of Sydney, Pp 35-54.