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Performance of Romney and $^{1}/_{4}$ Merino x $^{3}/_{4}$ Romney sheep on Wanganui hill country.

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ABSTRACT

The performance of hoggets of part-superfine-Merino ancestry born in 1994 and 1995 were compared with straightbred Romneys (R) in a highly selected nucleus flock on a hill country property, near Wanganui. All animals were born to R ewes. In addition to R, $^{1}/_{2}$ Merinos ($^{1}/_{2}$ M) were born in 1993 and $^{1}/_{4}$ Merino ($^{1}/_{4}$ M) in 1994 and 1995.

The $^{1}/_{4}$ M and R sheep born in 1994 did not differ significantly in hogget greasy fleece weight, live weights, growth rates, or faecal egg and nematode counts. Midside fleece samples collected at two-tooth ewe shearing in late February 1996 showed that the $^{1}/_{4}$ M sheep were finer, more yellow, more-bulky and had shorter wool than the R sheep.

For $^{1}/_{4}$ M and R sheep born in 1995, the $^{1}/_{4}$ M genotype had a lower hogget greasy fleece weight, weaning weight and 12 month live weight. The $^{1}/_{4}$ M hogget wool was finer, brighter, less yellow, bulkier and shorter than the R midside wool. Clean scoured yield was not significantly different.

Keywords: Sheep; Merino; Romney; crossbreeding; live weight; wool.

INTRODUCTION

Crossbreeding can be used in a number of ways to lift productivity so as to better match the products of the sheep industry to markets. The availability of rams of breeds or strains that have different production characteristics, coupled with crossbreeding, provides New Zealand sheep farmers with flexibility to more-rapidly adjust to changing economic and market circumstances.

The introduction of genes for fine-wool production by crossing Romney ewes with Merino rams, offers a potential solution when the wool of a Romney flock is regarded as being too strong for future market conditions. Meikle *et al* (1988) reported least squares means for mean fibre diameter from Romneys, Superfine Merinos, Local Merinos, Superfine Merino x Romney, Local Merino x Romneys and Backcross (3/4 Superfine Merinos) as 37.3, 20.7, 22.6, 26.2, 28.2 and 21.2µm respectively. Possible disadvantages foreseen with crossbreeding using Merinos are lower fecundity and slower growth rate, lower quality of the pelts, more fleece rot and discolouration and more adverse effects from foot diseases and roundworms. The present work studies some aspects of the performance of sheep of part superfine-Merino ancestry with straightbred Romneys.

MATERIALS AND METHODS

Sheep

In 1993, about 450 straightbred Romney (R) ewes, on the property of D. and A. Polson near Wanganui, were crossed with three Superfine Merino rams to obtain $^{1}/_{2}$ Merino-$^{1}/_{2}$ Romney ($^{1}/_{2}$M) progeny. In 1994 a random selection of older ewes were mated to $^{1}/_{2}$M ram lambs to obtain $^{1}/_{4}$ Merino-$^{3}/_{4}$ Romney ($^{1}/_{4}$M) progeny. In 1995 R ewes were again mated to $^{1}/_{2}$M rams to generate more $^{1}/_{4}$M progeny. A total of 13 R rams and two $^{1}/_{2}$M rams were used in the recorded flocks for the 1995 mating.

Animalplan records

Animalplan records of birth rank (BR), rearing rank (RR), hogget greasy fleece weight at 12 months of age (FWT), weaning weight at 5 months of age (WWT), live weight at 8 months of age (LW8) and live weight at 12 months of age (LW12) were obtained. Lamb survival rate born as twins (SRT), lamb survival rate regardless of family size (SRB), growth rate between WWT and LW8 (GRA), growth rate between LW8 and LW12 (GRB) and total growth rate between WWT and LW12 (GRT) were calculated. Two estimates of susceptibility to roundworms, faecal egg count (FEC) and nematode count (NEM), were made when the lambs were about 6 months old.

Hogget greasy fleece weight (HFW) was recorded immediately following shearing (belly wool and pieces were not included). The measured HFW represented a growth of approximately 8 months for the hoggets.

Midside wool measurements

Mid-side fleece samples were collected at ram-hogget shearing in August 1996 and ewe hogget shearing in September 1996. The wool was grown over the previous seven and eight months respectively. There were 272 R and 177 $^{1}/_{4}$M midside samples collected.

On February 23 1996, midside wool samples were collected at shearing from 42 R and 35 $^{1}/_{4}$M two-tooth ewes. These samples were also assessed for fleece quality characteristics.

Each midside fleece sample was subjectively assessed for handle (HAN), lustre (LUS), hand soundness (SOU), freedom from cott (COT) and pre-scour whiteness (COL). These traits were graded on a 1 to 9 scale. The score of 9 was allocated to the expression considered most desirable and 1 to the least desirable. The extreme values on the scale of 1 and 9 were seldom used. The midside fleece samples were also subjectively measured for staple length (STL), total crimp number (TCN), crimp frequency (CRF), clean scoured yield (YLD), loose wool bulk (BLK), Y reflectance (Y), Z reflectance (Z) and Y-Z reflectance (YZ). Mean fibre diameter (MFD), coefficient of variation of fibre diameter (CVD) and percentage of medullated fibres (MED) were measured by OFDA (Baxter *et al.*, 1992).

Data analysis

Only a small number of sires were used to produce part-M progeny. A strict form of significance testing would have involved using the sire-within-genotype variance as the error term. This would have indicated whether the genotypes would usually be different, no matter which rams were chosen as sires. However, the low error degrees of freedom using this form of analysis on these data means that between genotype differences have to be very large before they were significant. Instead the random residual was used as the error term. This means that genotype differences may have arisen through chance effects in the choice of sires in a particular year.

RESULTS

Animalplan records 1994

Tables 1 shows the least squares mean and its standard error for each trait in each genotype taken from the 1994 born animals. Relative to the flock, SRT and SRB were found to be significantly lower in the $^1/_4$M animals. All other characteristics derived from 1994 Animalplan records, shown in Table 1, were not significantly different between the two genotypes.

Animalplan records 1995

Table 1 shows the least squares mean and its standard error for each trait in each genotype taken from the 1995 born animals. Relative to the flock, FWT was significantly lower in the $^1/_4$M hoggets. WWT and LW12 were lower in the $^1/_4$Ms. There were no significant differences between the two genotypes in lamb survival rates, GRB and GRT.

Fleece quality traits of 1995 born animals

Table 2 shows the least squares mean for each genotype of the subjectively assessed fleece characteristics. Relative to the flock, the wool sampled from the $^1/_4$M hoggets was softer in handle, less lustrous, less sound, whiter pre-scouring and less cotted.

Table 3 shows the least squares mean for each genotype of each objectively measured fleece characteristic. In these data HFW was 0.4 kg higher for the R hoggets. There was no difference in YLD. STL was 20mm shorter and MFD was 6.3µm finer in the $^1/_4$M flock. The CVD was slightly higher and the MED was lower in the $^1/_4$M hoggets. TCN, CRF, BLK and Y and Z reflectance were all significantly higher in the $^1/_4$M hoggets. Midside wool from the $^1/_4$M hoggets was less yellow. An analysis of covariance indicated that much of the variation in BLK between and within the genotypes was associated with differences in CRF.

Table 2 shows the least squares mean and standard error for each genotype of traits subjectively assessed in midside wool samples taken at two-tooth pre-tup shearing in February 1996. Relative to the two-tooth ewes, the

TABLE 1: Least squares means (SE) from 1994 and 1995 Animalplan records.

Characteristic	1994 R (n=1580)	1994 $^1/_4$M (n=100)	1994 Significant	1995 R (n=1789)	1995 $^1/_4$M (n=277)	1995 Significant
FWT (kg)	2.82 (0.03)	2.80 (0.15)	NS	2.90 (0.06)	2.60 (0.06)	***
SRT	0.98 (0.01)	0.87 (0.031)	***	90.95 (1.04)	93.38 (1.89)	NS
SRB	0.99 (0.01)	0.90 (0.03)	**	0.92 (0.01)	0.93 (0.01)	NS
WWT (kg)	26.3 (0.85)	26.2 (1.61)	NS	25.8 (0.82)	23.7(0.89)	***
LW8 (kg)	39.0 (1.44)	39.5 (2.36)	NS	37.9 (1.58)	36.8 (1.86)	NS
LW12 (kg)	42.7 (1.24)	41.1 (2.03)	NS	40.8 (0.96)	39.2 (0.99)	***
GRA (g/day)	117 (5.2)	122 (14.0)	NS	123 (10.6)	134 (12.5)	**
GRB (g/day)	51 (3.7)	39 (9.4)	NS	14.5 (3.17)	15.33 (3.50)	NS
GRT (g/day)	77 (4.5)	71 (7.4)	NS	53.9 (0.89)	55.6 (1.1)	NS
FEC	206 (35)	299 (96)	NS			
NEM	354 (46)	215 (125)	NS			

TABLE 2: Least squares means (SE) of subjective fleece characteristics (scale 1-9) at hogget and two-tooth pre-tup shearing.

Characteristic	Hogget R (n=272)	Hogget $^1/_4$M (n=177)	Hogget Significant	Two-tooth R (n = 42)	Two-tooth $^1/_4$M (n = 35)	Two-tooth Significant
HAN	4.97 (0.04	5.6 (0.1)	***	5.12 (0.1)	5.6 (0.1)	**
LUS	4.54 (0.04)	4.08 (0.05)	***	5.10 (0.12)	3.37 (0.14)	***
SOU	6.16 (0.07)	5.88 (0.09)	*	8.10 (0.16)	6.83 (0.18)	***
COL	6.0 (0.05)	6.64 (0.06)	***	6.17 (0.12)	6.20 (0.13)	NS
COT	6.12 (0.04)	6.42 (0.05)	***	6.38 (0.07)	6.09 (0.08)	**

TABLE 3: Least squares means (SE) of objective fleece characteristics at hogget and two-tooth pre-tup shearing.

Characteristic	Hogget R (n=272)	Hogget $^1/_4$M (n=177)	Hogget P	Two-tooth R (n=42)	Two-tooth $^1/_4$M (n=35)	Two-tooth P
HFW (kg)	3.03 (0.03)	2.62 (0.03)	***			
YLD (%)	76.8 (0.3)	76.44 (0.36)	NS	74.75 (1.49)	67.42 (1.63)	**
STL (mm)	119.4 (0.8)	99.3 (0.97)	***	107.86 (1.73)	79.29 (1.89)	***
MFD ((m)	36.72 (0.15)	30.41 (0.18)	***	39.36 (0.29)	33.58 (0.33)	***
CVD	22.03 (0.14)	22.47 (0.17)	*	21.8 (0.4)	23.11 (0.38)	*
MED (%)	1.48 (0.14)	0.27 (0.17)	***			
TCN	15.5 (0.21)	19.0 (0.3)	***	9.17 (0.41)	11.97 (0.45)	***
CRF (cm)	1.31 (0.02)	1.92 (0.03)	***	0.86 (0.05)	1.53 (0.06)	***
BLK (cm^3/g)	23.5 (0.20)	24.9 (0.2)	***	20.43 (0.34)	23.26 (0.37)	***
Y Reflectance	55.02 (0.14)	57.13 (0.17)	***	55.27 (0.53)	54.82 (0.58)	NS
Z Reflectance	51.69 (0.21)	55.36 (0.25)	***	52.31 (0.71)	50.57 (0.77)	NS
Y - Z	3.33 (0.01)	1.76 (0.12)	***	2.96 (0.29)	4.25 (0.31)	**

fleeces of the $^1/_4$M ewes were significantly softer in handle, lower in character grade, less lustrous, and more entangled. The R wool was extremely sound and the $^1/_4$M wool less so. There was no significant difference in subjective pre-scour whiteness between the two groups.

Table 3 shows the least square mean and standard error for objectively assessed fleece characteristics of two-tooth midside samples taken in 1996. YLD, MFD and STL were significantly lower in the $^1/_4$Ms. TCN, CRF, BLK, Y-Z and CVD were higher in the $^1/_4$Ms when compared with the Rs. There were no significant differences in Y and Z reflectance between the two groups.

DISCUSSION

Growth rate, liveweight and fleece weight

There were no significant differences in FWT, live weight traits, growth rate traits and FEC and NEM between the R and $^1/_4$M born in 1994. Heterosis is greatest in characters most closely associated with the ability to survive and reproduce (Kinghorn, 1987). Therefore M x R animals, particularly the F_1 $^1/_2$Ms, might not be more susceptible to roundworm infections despite the reputation of M for low resistance to roundworms. In 1995 however, FWT, WWT and LW12 were significantly lower in the $^1/_4$M animals. From observation at hogget shearing of 1995 born sheep, it appeared that the $^1/_4$M hogget fleeces were skirted more heavily by the wool-handlers. This would contribute to the $^1/_4$M hoggets having lower skirted HFW than the R animals. Measurements of wool characteristics based on the midside wool samples would not be influenced by the degree of skirting.

A constraint with the part-M data was that it was collected from the progeny of only a small number of sires. Thus the differences in R versus $^1/_4$M comparisons between 1994 and 1995 could be due to the difference in the $^1/_2$M sires used to produce $^1/_4$M progeny in each year.

The $^1/_4$M animals were born and raised by much older R ewes. BR and RR of these animals were significantly lower. These are possibly more a reflection of the R ewes that produced the two genotypes of lambs. Dam age may have been a factor in the lower WWT of the $^1/_4$M animals born in 1995. It would appear that compensatory growth and/or heterosis enabled faster growth rates of the $^1/_4$M lambs from weaning to 8 months of age.

Fleece characteristics

Yield-related traits

YLD was significantly lower in the $^1/_4$M two-tooth ewes when compared with the R two-tooth ewes. High sand contamination was prevalent in the $^1/_4$M two-tooths. Whether this was due to the finer fleece holding more sand or due to their being held separately in a paddock or yard where extra contamination occurred, is not clear. The YLD of the midside hogget samples was not significantly different between genotypes born in 1995.

Fineness-related observations

The midside wool from the $^1/_4$M hoggets and two-tooth ewes was about 6 µm finer, on average, than that of the R contemporaries. The CVD was slightly higher in the 1995 born $^1/_4$M genotype. The slightly higher CVD in the $^1/_4$M wool would have limited effect on the handle (Roberts 1956).

Bulk-related observations

Midside samples of the $^1/_4$M wool were 6% (1.4 cm^3/g) bulkier in the hoggets and 14% (2.8 cm^3/g) bulkier in the two-tooth ewes compared with that of their R contemporaries.

Colour-related observations

Midside wool from the spring-shorn $^1/_4$M hoggets was 1.6 Y-Z units whiter and 2 Y units brighter than wool shorn from the R. However, wool shorn from the $^1/_4$M two-tooth ewes in February 1996, was 1.3 Y-Z units yellowier than wool shorn from the R two-tooth ewes. Fraser (1957) has pointed to the association between ‘closed’ slow-drying fleece type and discolouration. The $^1/_4$M ewes had a more ‘closed’ fleece structure that was also more entangled than that of the R ewes. High summer time humidity and consequently poor drying of these $^1/_4$M ewe fleeces has probably promoted yellow discolouration.

Profitability

Relative profitability studies (Everett-Hincks, 1997) based on the above comparisons have indicated that, with 1996 product prices, there was not much difference between the genotypes, even though the R used in the comparison were in a highly-selected nucleus flock. On a per sheep basis, with high meat and low wool prices, the marginally higher live weights of the R sheep would probably result in them being slightly more profitable. However, if the lower adult weight allowed a higher stocking rate of the $^1/_4$Ms relative to the R, profit per hectare for the $^1/_4$M sheep would exceed that of the R. Recent increases in premiums for wool fineness will also favour the part-M.

Information is still to be gathered on the reproductive rate and maternal performance of the part-M ewes relative to the R ewes to permit a full analysis of their relative profitability to be undertaken.

CONCLUSIONS

On the basis of the presented evidence, $^1/_4$M genotypes showed little sign of the production problems that most North Island farmers believe to be associated with M and part-M sheep. Live weight and growth rate figures did not differ greatly between $^1/_4$M and R genotypes. The $^1/_4$M hoggets were progeny of older R ewes and this may have adversely affected their weaning weight and subsequent live weight. Whiteness, fineness and increased bulk of the part-M genotype wool will probably result in price premiums over R wool in most years. Changes in these characteristics make the wool better suited to hand-knitting yarns and carpet manufacture, the predominant uses of wools over 30µm.

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