Growth and carcass characteristics of lambs sired by Texel, Oxford Down and Suffolk rams

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ABSTRACT

Three hundred and twelve lambs (160 ram, 152 ewe) sired by Texel (n = 118), Oxford Down (n = 94) and Suffolk (n = 100) rams and out of Romney ewes were grazed at Poukawa Research Station, Hastings, to evaluate comparative growth characteristics and carcass composition. Lambs were sourced from a range of commercial properties and sires. Representative samples from each breed and sex were slaughtered after 84, 112 and 145 days on trial.

Fasted liveweight gain were significantly (P<0.001) higher for Suffolk-cross (107 g/d) and Oxford Down-cross (101 g/d) lambs than for Texel-cross lambs (84 g/d).

At a constant hot carcass weight (HCW) of 19.2 kg, Texel-cross lambs had a significantly (P<0.01) lower GR (mean 12.0 mm) than Suffolk-cross (14.1 mm) and Oxford Down-cross (13.3 mm) lambs.

Carcasses were boned to a commercial specification which maximised the removal of bone and fat. At a carcass weight (CW) of 19.2 kg Texel-cross lambs had a significantly (P<0.001) higher saleable meat yield (SMY; 647 g/kg CW) than Suffolk-cross (634 g/kg) and Oxford Down-cross (629 g/kg) lambs. Texel-cross and Oxford Down-cross lambs had a higher proportion of the SMY in high value cuts (HVC) than Suffolk-cross lambs. At a CW of 19.2 kg Suffolk-cross lambs (395 g HVC/kg SMY) had a lower yield than Texel-cross (402 g/kg; P<0.001) and Oxford Down-cross (400 g/kg; P<0.05) lambs. There was no breed by sex interaction, but ewe lambs yielded a significantly higher proportion of HVC in their SMY (402 v 396 g/kg for ewe and ram lambs respectively, P<0.001).

At a CW of 19.2 kg eye muscle area was significantly higher (P<0.001) for Texel-cross lambs (13.5 cm^2) than for Suffolk-cross and Oxford Down-cross (both 12.7 cm^2) lambs, with no sex differences.

Keywords: Texel; Oxford Down; Suffolk; lamb; growth; carcass.

INTRODUCTION

The use of terminal sire breeds of sheep in lamb finishing enterprises can improve profitability if lamb growth rate and/or carcass value is increased. Breeds which have the potential to improve profitability are those with a high mature weight (eg Oxford Down) and those with a genetic propensity to leanness and high meat yield (eg Texel (Clarke *et al.,* 1984; Purchas *et al.,* 1990)). There are limited data on the commercial productivity of these breeds under New Zealand conditions (Clarke *et al.,* 1988; McMillan *et al.,* 1988), particularly in relation to terminal meat breeds previously available in New Zealand, although several overseas comparisons have been conducted (More O'Ferrall and Timon, 1977a, 1977b; Wolf *et al.,* 1980; Cameron and Drury, 1985; Croston *et al.,* 1987; Kempster *et al.,* 1987). This experiment was conducted to evaluate the relative merits of lambs sired by Texel, Oxford Down and Suffolk rams and out of Romney ewes for post weaning growth rate and carcass composition.

MATERIALS AND METHODS

Animals

Lambs weighing between 23 and 26 kg liveweight were obtained from six commercial properties at weaning. Each property supplied approximately 10 ram and 10 ewe lambs from at least two of the breeds. The number of sires represented was unknown. A total of 312 lambs were obtained, comprising 118 Texel-cross, 96 Oxford Down-cross and 100 Suffolk-cross.

Management

Lambs were tagged and drenched with Ivomec on arrival. They were held in yards overnight and weighed the following morning to give an initial fasted liveweight. They were grazed as a single mob until slaughter, initially on pasture for 3 weeks and then on Brassica crop (Winfred rape) at a high dry matter allowance until slaughter. Lambs were weighed fortnightly and drenched at 4 week intervals with Valbazen™.

Slaughter protocol

A sample of each breed, balanced for source, sex and liveweight, was slaughtered at monthly intervals. On the day preceding slaughter lambs were weighed and held in yards overnight. A fasted weight was obtained on the morning prior to transport to Progressive Meats Ltd for slaughter and processing. Slaughter was by electric stunning and exsanguination. Carcasses were held overnight at 4°C prior to being boned out by trained butchers. The same butchers were used, doing the same tasks, on all three slaughter dates.

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MEASUREMENTS

Hot carcass weight and GR (fat depth over the 12th rib 11 cm from the midline, Kirton and Johnson, 1979) were measured on the slaughter chain by a trained grader. Carcasses were dissected to a commercial specification which gave maximum separation of meat while retaining maximum commercial value. Saleable meat therefore included various amounts of fat and bone in some cuts. The cuts recorded were boneless tenderloin (fillet), boneless shortloin (loin), processed 7 rib rack (French rack), boneless hindleg (collectively high value cuts), boneless forequarter, bone-in hindshank, bone-in foreshank, bone-in flap, bone-in neck and edible trimmings. Eye muscle area was measured on the cut surface of *m. longissimus dorsi* on the cut surface between the 12th and 13th thoracic vertebrae. The muscle outline was traced onto acetate sheets and measured by a screen pixel counting technique using a digitising tablet (Houston instruments) programmed to a resolution of 1 mm^2.

STATISTICS

Data were analysed using Generalised Linear Model (GLM; SAS, 1987). Lamb source and sex were used as covariates for growth and carcass weight analysis and hot carcass weight was a covariate for carcass trait analysis. Least square means (LSM) were used to test differences between treatments. Logarithmic regressions of GR on hot carcass weight were used as these had higher correlation coefficients than linear regressions.

RESULTS AND DISCUSSION

Growth rate

Average fasted liveweight gains were 107, 101 and 84 g/d for Suffolk-cross, Oxford Down-cross and Texel-cross lambs respectively. Texel-cross lambs had a significantly lower growth rate than Suffolk-cross and Oxford Down-cross lambs ($P<0.001$; Table 1). Liveweight gains were lower in the early part of the trial when lambs were on pasture and adapting to brassica crop, increasing as the trial progressed (Table 1). The comparative growth rate of the three breeds was similar throughout.

The similarity in growth rate of Suffolk-cross and Oxford Down-cross lambs is in agreement with previous studies (More O'Ferrall and Timon, 1977a; Wolf *et al.*, 1980; Kempster *et al.*, 1987, McMillan *et al.*, 1988). There are few studies with which to compare the post weaning growth rate of Texel-cross lambs. From the data of More O'Ferrall and Timon (1977a) post weaning growth rate was assessed at 146.5, 136.4 and 125.9 g/d for Suffolk-cross, Oxford Down-cross and Suffolk-cross lambs. Relative to Suffolk-cross at 100, these represent growth rates of 93 and 86 for Oxford Down-cross and Texel-cross lambs, results in close agreement to the present study.

The highest LWG by source was 23.5, 15.3 and 5.5% above the breed average for Texel-cross, Oxford Down-cross and Suffolk-cross lambs respectively, suggesting there is large potential to increase growth rate by selection within the Texel and Oxford Down breeds.

Carcass traits

The average hot carcass weight (HCW) and GR are given in Table 2. Logarithmic regressions of GR on HCW were significantly affected by breed and sex but not by kill date.

TABLE 1: Means for fasted liveweight gain (LWG; g/d) ± s.e. of ram and ewe lambs sired by Texel, Oxford Down or Suffolk rams. Values in parenthesis are a percentage of Suffolk-cross lambs of the same sex.

Sex	Kill	Sire breed Texel	Oxford Down	Suffolk
Ram	1	69 ± 8.2 (81)	79 ± 9.5 (92)	85 ± 6.4 (100)
Ram	2	109 ± 6.6 (84)	126 ± 7.4 (97)	130 ± 6.2 (100)
Ram	3	126 ± 8.1 (80)	155 ± 5.7 (98)	157 ± 5.7 (100)
Ewe	1	64 ± 7.0 (70)	74 ± 4.7 ((91)	81 ± 6.8 (100)
Ewe	2	91 ± 5.7 (83)	105 ± 4.0 (96)	109 ± 4.8 (100)
Ewe	3	113 ± 8.5 (80)	126 ± 7.5 (89)	142 ± 6.3 (100)
All	All	84 (79)	101 (94)	107 (100)

TABLE 2: The mean hot carcass weight (HCW) and GR of lambs sired by Texel, Oxford Down and Suffolk rams.

Sex	Kill	Sire breed Texel		Oxford Down		Suffolk	
		HCW	GR	HCW	GR	HCW	GR
Ram	1	15.7	6.2	16.1	7.5	16.6	8.6
Ram	2	18.8	10.1	18.8	11.7	20.8	14.4
Ram	3	22.8	14.2	24.7	18.1	25.0	20.1
Ewe	1	15.0	7.8	16.0	11.1	16.0	8.9
Ewe	2	17.2	10.7	19.1	13.9	19.1	16.2
Ewe	3	20.6	16.6	21.9	18.9	22.9	22.2

TABLE 3: Semi-logarithmic regressions (LogeGR = a + b x HCW; r = coefficient of correlation) of GR on hot carcass weight (HCW) for ram and ewe lambs sired by Suffolk, Oxford Down and Texel rams. Also, predicted GR and HCW at constant HCW and GR, respectively.

	Sire breed					
	Texel		Oxford Down		Suffolk	
	Ram	Ewe	Ram	Ewe	Ram	Ewe
a	0.491	-0.436	0.169	0.643	0.656	0.157
b	0.092	0.156	0.111	0.104	0.091	0.127
r	0.870	0.643	0.831	0.806	0.913	0.871
GR at 16 kg HCW	7.1	7.9	7.0	10.0	8.2	8.9
GR at 20 kg HCW	10.3	14.7	10.9	15.1	11.8	14.8
HCW at 8 mm GR	17.2	16.1	17.2	13.9	15.7	15.2
HCW at 12 mm GR	21.6	18.7	20.9	17.8	20.2	18.4

The regression coefficients are given in Table 3, along with predicted GR at constant HCW and predicted HCW at constant GR. Texel-cross lambs had significantly lower GR values then Suffolk-cross and Oxford Down-cross lambs (P<0.01). The latter breeds were not significantly different (P>0.05). Clarke and Kirton (1990) observed that Texel-cross lambs had a similar GR to Suffolk-cross lambs at around 16 kg HCW. Above that weight Texel-cross lambs were leaner, with GR approximately 3 mm lower at 22 kg HCW. This trend was not apparent in the present study, with Texel-cross lambs having a 1 mm lower GR at 16 kg HCW, increasing to 1.7 mm at 22 kg HCW for ram lambs and decreasing to zero at 20 kg HCW for ewe lambs. The advantage of Texel rams in siring low GR lambs is biologically large and approximately double reported values for genetically selected lean lines, relative to control lines, of sheep in New Zealand (Bennett *et al.*, 1988; Fennessy *et al.*, 1992).

Saleable meat yield (SMY)

SMY (g/kg cold carcass weight) values are given in Table 4. SMY decreased as GR increased (P<0.001) but was not affected by sex or carcass weight (P>0.05). This is in agreement with Kirton *et al.* (1985), who showed that GR was more closely related to muscle percentage than HCW.

There were significant breed differences, with Texel-cross lambs having higher SMY than Suffolk-cross and Oxford Down-cross (P<0.001) at a similar carcass weight (647, 634 and 629 g/kg respectively) and at a similar GR (645, 636 and 630 g/kg respectively). Suffolk-cross lambs had significantly higher SMY than Oxford Down-cross lambs at similar GR (P<0.05) but not at a similar carcass weight (P>0.1). These data are in close agreement with previous studies, both in the ranking of the breeds and in the magnitude of the differences (Wolf *et al.*, 1980; Croston *et al.*, 1987; Kempster *et al.*, 1987).

TABLE 4: Saleable meat yield (SMY; g/kg cold carcass weight (CCW)) of Texel-cross, Oxford Down-cross and Suffolk-cross lambs at each kill and adjusted to a common HCW of 19.2 kg and GR of 13 mm.

		Sire breed		
Sex	Kill	Texel	Oxford Down	Suffolk
Ram	1	659	636	637
Ram	2	649	632	631
Ram	3	643	623	623
Ewe	1	653	634	639
Ewe	2	651	628	635
Ewe	3	634	615	615
Constant CW		647[a]	629[b]	634[b]
Constant GR		645[a]	630[b]	636[c]

Values with differing superscript are significantly different (P<0.05)

The weight of saleable meat (kg) was very closely related to carcass weight, with within-breed and within-sex coefficients of correlation of over 0.99. The reduction in weight of saleable meat associated with increasing GR had a minor influence. It was calculated that the reduction in weight of saleable meat associated with a 1 mm increase in GR on a 20 kg carcass would be equivalent to a reduction in carcass weight of 30g. This is in agreement with the general acceptance that the magnitude of breed differences in sheep, although statistically significant, are biologically small (Cameron and Drury, 1985; Butler-Hogg *et al.*, 1988; Kirton and Morris, 1989).

High value cuts

The proportion of the saleable meat represented by high value cuts (HVC; g/kg) is given in Table 5. HVC decreased with increasing GR and was significantly affected by breed and sex. At a constant GR Suffolk-cross lambs (396 g/kg SMY) had a lower proportion of HVC than Oxford Down-cross (400 g/kg SMY); P<05) and Texel-cross lambs (401 g/kg SMY); P<0.01). Texel-cross and Oxford Down-cross were not significantly different (P>0.25). Previous studies of these breeds have shown small, inconsistent breed differences in the proportion of HVC (More O'Ferrall and Timon, 1977b; Wolf, 1982; Cameron and Drury, 1985; Croston *et al.*, 1987; Clarke and Kirton, 1990). The absolute results will be affected by the choice of cuts and their preparation, but these factors should not markedly affect breed ranking. Wolf (1982) observed a similar proportion of HVC for Suffolk-cross and Texel-cross lambs, which was slightly (1.3%) ahead of Oxford Down-cross lambs. Croston et al (1987) observed a small advantage in favour of Suffolk-cross lambs of 1.6% and 0.8% over Texel-cross and Oxford Down-cross lambs, respectively. Cameron and Drury (1985) observed no difference between Texel-cross and Oxford Down-cross lambs.

At a constant GR ewe lambs had a higher proportion of HVC than ram lambs (403 vs 395 g/kg CCW; P<0.001). This difference was similar to the between breed variation and has been reported previously (Taylor *et al.*, 1980; Wolf, 1982).

TABLE 5: The yield of high value cuts (HVC; g/kg saleable meat yield (SMY) of Texel-cross, Oxford Down-cross and Suffolk-cross lambs at each kill and adjusted to a common HCW of 19.2 kg and a GR of 13 mm.

		Sire breed		
Sex	**Kill**	**Texel**	**Oxford Down**	**Suffolk**
Ram	1	411	406	408
Ram	2	392	385	385
Ram	3	391	384	387
Ewe	1	419	414	410
Ewe	2	405	399	392
Ewe	3	400	390	395
Constant CW		402[a]	400[a]	395[b]
Constant GR		401[a]	400[a]	396[b]

Values within rows without similar superscripts are significantly different (P<0.05)

Eye muscle area (EMA)

EMA was linearly related to carcass weight, with significant breed differences. At a HCW of 19.2 kg Texel-cross lambs (13.5 cm^2) had a 6% larger EMA than Oxford Down-cross and Suffolk-cross lambs (both 12.7 cm^2; P<0.001). At a constant EMA of 13.0 cm^2 the HCW of Texel-cross, Oxford Down-cross and Suffolk-cross lambs were predicted to be 18.0, 20.0 and 19.6 kg, respectively.

The full expression of sire-breed differences in EMA would be achieved when lambs were drafted to a constant GR. At a similar GR of 10 mm, Texel-cross ram lambs would have a 9.5% (13.7 v 12.5 cm^2) larger EMA than Suffolk-cross ram lambs (7.0% (12.5 v 11.7 cm2) for ewe lambs).

These differences are very similar to previous studies. More O'Ferrall and Timon (1977b) and Wolf et al (1980) observed that Texel-cross lambs had an EMA 7 and 8% larger than Suffolk-cross and Oxford Down-cross lambs, respectively, at approximately 17 and 16 kg carcass weight in the respective studies. Clarke et al (1988) reported an advantage to Texel-cross lambs of 7 and 5% over Oxford Down-cross and Suffolk-cross lambs, respectively. Similar values reported by Kempster et al (1987) were 4.5 and 7%, although Texel-cross lambs were 0.2 and 0.75 kg lighter than Oxford Down-cross and Suffolk-cross lambs, respectively, therefore underestimating the potential advantage to Texel-cross lambs.

CONCLUSION

There were only small differences between Suffolk and Oxford Down sired lambs, but these were significantly different from Texel-cross lambs. Compared to Suffolk-cross lambs Texel-cross lambs grew more slowly, were leaner, had higher saleable meat yields, a higher proportion of high value cuts and larger eye muscle areas. The commercial advantage of these carcass traits depends on the existence, or development, of markets for larger cut size at a low GR, where Texels would have an advantage in producing to specification. In the short term the Texel breed would be best served by placing high emphasis on selection for growth rate.

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