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## Effects of grazing pressure and competition on growth rate of Merino and Romney lambs

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### ABSTRACT

The growth rates of Merino and Romney lambs were compared at three stocking rates (200, 100 and 50 lambs/hectare) but at the same herbage allowance (2 kg DM/head/day). To achieve this, lambs at lower stocking rates were allocated different areas (0.2, 0.4 and 0.8 ha) and shifted at different frequencies (5.1, 9.8 and 24.5 days, respectively). At each stocking, rate groups of 10 lambs of each breed were grazed both separately and together. Each treatment was replicated. Grazing clocks were used to record grazing times in the mixed grazing groups at both the high and low stocking rates.

Romney lambs grew significantly faster than Merinos ( $P < 0.001$ ) at all stocking rates. As stocking rate increased there was an overall decrease in LWG ( $P < 0.001$ ). However LWG of Merinos decreased at a significantly faster rate ( $P < 0.005$ ). The effects of stocking rate on breed differences in LWG were supported by grazing data. At 50 lambs/ha, Merinos and Romneys grazed for 10.5 and 11.1 hrs/d, respectively. At 200 lambs/ha, Merinos grazed for 7.2 hrs/d, compared with 11.0 hrs/d for Romneys. The pattern of grazing also changed, with Merinos spending more daytime grazing as stocking rate increased from 50 to 200 lambs/ha (60% versus 82%) whereas Romneys continued to spend 80% of total grazing time as daytime grazers.

**Keywords** Merino, Romney, lambs, grazing, growth.

### INTRODUCTION

Sustained high prices for fine wool in the 1980's led to an influx of Merinos onto improved pastoral land and, subsequently, more intensive farming of this breed. In order to evaluate Merinos under North Island conditions a group of mixed age Merino ewes was transported from the South Island in 1986. Over the following three years they were grazed with a flock of Romney ewes to gather comparative production data. It was observed that under some conditions (i.e. rotational grazing in small paddocks) that Merino ewes would lose weight whilst the Romney ewes with them would increase in liveweight (P.D. Muir and G.J. Wallace, unpublished observations).

Since no data were available to indicate differences in grazing behaviour between Merinos and other breeds, the present study was set up to compare the performance of the two breeds (Merino and Romney) under different grazing regimes.

### MATERIALS AND METHODS

#### Animals and Treatments

The experiment was carried out at the Takapau Research Station between the 4th of April and 23rd of May 1990. One hundred and twenty Merino ewe lambs and a similar number of Romney ewe lambs were transferred from the Wanganui Hill Country Research Station in late March. Animals were ranked within breeds using an unfasted live weight and allocated to 24 treatment groups each consisting of ten animals. In order to provide information on the effects of competition between Merinos and Romneys, breeds were grazed both separately and together to give a total of four groups. In addition animals were grazed at three different stock densities to provide data on the effects of grazing pressure on the two breeds. This was achieved by using paddocks ranging from 0.2 ha up to 0.8 ha and offering

the groups areas of pasture of either 50, 100, or 200 square metres per head. These equated to stocking densities of 200, 100 and 50 lambs/hectare. All lambs were offered allowances of approximately 2.0 kgDM/head/day. Animals at the higher stocking rates were shifted more frequently so as to maintain the same per head allowance (Figure 1). Each treatment was replicated twice. Both old and new pasture types were available and the lambs in each replicate were maintained on either old or new pasture respectively throughout the experiment.

**FIGURE 1** Experimental design.

0.2 Hectare	0.4 Hectare
10 Merino	10 Merino
5 Merino + 5 Romney	5 Merino + 5 Romney
5 Romney + 5 Merino	5 Romney + 5 Merino
10 Romney	10 Romney
0.8 Hectare	
10 Merino	
5 Merino + 5 Romney	
5 Romney + 5 Merino	
10 Romney	

All lambs were weighed after overnight fasting and drenched when the trial began, weighed and drenched again at four weeks with a final fasted weight was recorded after seven weeks.

Grazing clocks specifically designed to record grazing time and pattern were attached to lambs in the mixed grazing groups during the last three weeks of the trial to measure the relative grazing behaviour of Merinos and Romneys. They consisted of a low power microprocessor, housed in a waterproof shell and attached to a mercury switch located on the sheep's head. The mercury switch was adjusted so that the circuit closed when the sheep's head was in the down position (grazing) and opened when the head was up. Grazing time was recorded as the proportion of each hour that the head was in the down position.

## Pasture

Pre-grazing pasture cuts to ground level were carried out and growth rate was measured on two representative areas of pasture, one improved and one unimproved so that feed on offer and grazing days available could be calculated. A "put and take" system using spare animals was used to balance the grazing days between replicates and within each treatment (grazing area). Pasture samples were dissected into ryegrass, other grasses, legume, weed and dead material present in the sward.

## Statistical Analyses

Data were analysed by analysis of variance (SAS) and by using initial liveweight as a covariate. A general linear model was fitted using SAS to describe the relationship between liveweight gain and the area available per head.

## RESULTS AND DISCUSSION

The design of the trial in terms of stocking rate (200, 100 and 50 lambs/ha) at the same allowance resulted in three rotation speeds, with groups of lambs being shifted every 5.1, 9.8 and 24.5 days, respectively (Table 1). Pasture allowances ranged from 1.93 to 2.01 kg DM/head throughout the trial and were very close to the 2.0 kg DM/head originally targeted (Table 1).

**TABLE 1** Pasture mass (kg DM/ha), allowance (kg DM/sheep/day) and number of days grazing per shift. See text for explanation of pasture type and stocking rate. Data are expressed as means ( $\pm$  SEM).

Pasture Type	Stocking Rate (lambs/ha)	Pasture Mass	Pasture Allowance	Days Grazing
Old	50	2289 $\pm$ 14.9	1.97 $\pm$ 0.175	24.5 $\pm$ 3.47
	100	2013 $\pm$ 15.9	1.92 $\pm$ 0.429	9.8 $\pm$ 0.58
	200	2142 $\pm$ 20.3	2.01 $\pm$ 0.076	5.1 $\pm$ 0.54
New	50	2254 $\pm$ 7.6	1.93 $\pm$ 0.225	24.5 $\pm$ 3.47
	100	1865 $\pm$ 43.0	1.94 $\pm$ 0.056	9.8 $\pm$ 0.58
	200	2227 $\pm$ 24.1	1.99 $\pm$ 0.089	5.1 $\pm$ 0.54

As expected the pasture composition varied considerably between the old and new pasture, with the old pasture being considerably lower in legume than the new pasture paddocks (Table 2). The lower legume content was presumably associated with the significantly lower liveweight gains (mean 53 g/d of the lambs grazing the older pasture than those grazing the new pasture (mean 73 g/d; Table 3).

At commencement of the experiment, fasted liveweights were 23.8  $\pm$  0.21 kg and 28.1  $\pm$  0.23 kg for Merino and Romney

**TABLE 2** Mean composition (% on a DM basis) of old and new pasture at three stocking rates.

Pasture Type	Treatment Stocking Rate (lambs/ha)	Ryegrass	Pasture Composition (%)			
			Other grass	Legume	Weed	Dead
Old	50	31.3	33.9	2.4	2.2	30.2
	100	22.8	32.4	11.2	6.9	26.7
	200	31.3	25.5	9.1	10.6	23.5
New	50	32.8	6.4	19.0	1.6	40.2
	100	33.8	10.0	21.8	2.8	31.6
	200	45.5	7.0	19.4	0.6	27.5

lambs, respectively. At all stock densities significant differences in growth rate developed between the two breeds ( $P < 0.0001$ ) but covariate analysis was unable to distinguish whether this was due to initial differences in starting liveweight between the two breeds or a breed effect.

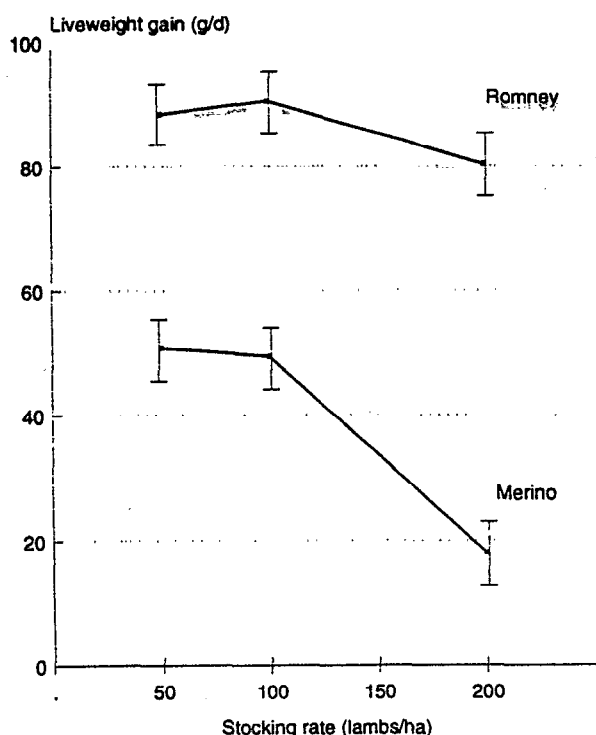
**TABLE 3** Mean liveweight gains ( $\pm$  SEM) of Merino and Romney lambs grazed separately and together on two pasture types and at three stocking rates.

Pasture Type	Treatment Group (Breed & Mix)	Stocking Rate (lambs/ha)	No. Animals	LWG (g/d) $\pm$ SEM
Old	Romney	50	10	70.41 $\pm$ 5.74
		100	10	80.00 $\pm$ 7.26
		200	10	70.20 $\pm$ 9.06
	Romney (with Merino)	50	10	64.29 $\pm$ 7.88
		100	10	98.98 $\pm$ 7.48
		200	10	78.98 $\pm$ 11.00
	Merino	50	9	36.51 $\pm$ 7.50
		100	10	54.90 $\pm$ 9.96
		200	10	18.78 $\pm$ 8.34
New	Merino	50	10	26.73 $\pm$ 8.47
		100	10	39.80 $\pm$ 6.76
		200	10	-9.80 $\pm$ 9.66
	Romney	50	10	101.22 $\pm$ 9.14
		100	10	93.88 $\pm$ 7.33
		200	10	96.53 $\pm$ 11.93
	Romney (with Merino)	50	10	117.76 $\pm$ 8.21
		100	10	89.18 $\pm$ 11.74
		200	10	75.71 $\pm$ 10.35
	Merino	50	10	63.47 $\pm$ 6.49
		100	10	56.33 $\pm$ 10.02
		200	10	35.31 $\pm$ 8.39

Poorest liveweight gains occurred when Merinos grazed in competition with Romneys (Table 3) but these were not significantly different from Merinos grazing by themselves. For the combined results there was a significant decrease in liveweight gain as stocking rate increased from 100 to 200 lambs/ha in the case of Merinos ( $P < 0.008$ ) but not for Romneys (Figure 2). The critical stocking rate for growth rate of Merino lambs appears to lie in excess of 100 lambs/ha.

Differences in liveweight gains with changing stock density were supported by the grazing data (Table 4). Only Merinos and Romneys grazing at 200 and 50 lambs/ha were compared. At the higher stocking rate, Merinos spent less time grazing (7 hours 12 minutes) than Romneys (11 hours 1 minute), whereas at the lower stocking rate the times spent grazing were similar (10

**FIGURE 2** Relationship between stocking rate and liveweight gain in Merino and Romney lambs.



hours 30 minutes and 11 hours 8 minutes, respectively). Thus grazing time of Romneys was not affected as stocking rate increased whereas Merinos grazed for a shorter time at higher stocking rates and performance suffered. Distribution of grazing periods was also affected as the available area per head declined. At the lower stocking rates, both Merinos and Romneys spent approximately equal times grazing during the day and night (60% and 40%, respectively). However, at the higher stocking rates, Merinos spent a higher proportion of their grazing time during the day and less during the night (82% and 18%, respectively). The observation was also made that the Merino lambs were more selective grazers than the Romney lambs which tended to graze the pasture more evenly. The reasons for these

**TABLE 4** Grazing times from Merino and Romney lambs grazed together at stocking rates of 200 and 50 lambs/ha.

3.1 Grazing times (hours:minutes per day)			
		200/ha	50/ha
Merino		7:12	10:30
Romney		11:01	11:08
3.2 Grazing times (hours:minutes) during the day (6am-6pm) and night (6pm-6am)			
		200/ha	50/ha
Merino	- day	5:56	6:08
	- night	1:16	4:22
Romney	- day	7:07	6:35
	- night	3:54	4:33
3.3 Percentage of total grazing during the day (6am-6pm) and night (6pm-6am).			
		200/ha	50/ha
Merino	- day	82.3	58.3
	- night	17.7	41.7
Romney	- day	64.6	59.3
	- night	35.4	40.7

differences are unclear, although a similar phenomenon was observed by Collins & Nicol (1986) when comparing the grazing behaviour of sheep and goats.

There were clearly differences between Merino and Romney lambs in response to increasing stocking rate (grazing pressure). Further research is needed to define the optimum requirement for best Merino performance and to develop management systems which cater for the intensive farming of this breed.

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