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## A BRIEF COMMUNICATION

### Breed variation in expression of faecal nematode egg count

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#### ABSTRACT

Faecal worm egg counts (FEC) were recorded on 779 lamb progeny in a performance recorded flock in Northland during summer-autumn 1990 to determine breed and sire variations. Progeny were ram lambs born in 1989 representing 4 Perendale, 4 Romney and 7 cross-bred sires.

The study protocol was that the lambs remained undrenched until the mean FEC of representative 'monitors' reached 1000-1500 eggs/g. Then all stock were faecal sampled, drenched and the protocol repeated. Full samplings occurred on 12 February (FEC1) and 12 March (FEC2). All animals grazed as one mob throughout the programme.

There were significant variations within and between breeds in FEC. Perendale and Crossbred lambs had significantly lower faecal egg outputs than Romneys on both occasions (FEC1=3560, 4073, 4757; FEC2=2535, 3242, 3737, respectively).

One possible explanation of the results is that Perendales selectively avoid parasite contamination on pasture through differences in grazing behavior. Alternatively, they may have consumed less pasture and larvae because they were lighter. If these are not the cases these data suggest that Perendales in this flock may be more resistant to internal parasites.

**Keywords** Nematode, parasites, genetic, resistance, breed, sheep, Romney, Perendale, faecal egg count, FEC.

#### INTRODUCTION

New Zealand's sheep flock is dominated by improved Romney and Romney-based breeds. As of 1989, Romney (45.9%), Coopworth (12.5%) and Perendales (7.9%) made up the majority of the national flock (Anon, 1991). Since faecal nematode egg count (FEC) correlates well with worm burden in sheep, it has been used to predict levels of infection for many years. It has also been shown to have a moderate heritability ( $h^2$ ), in the range of 0.29-0.40 (Piper *et al.*, 1978; Watson *et al.*, 1986; Baker *et al.*, 1991). As a consequence, stud breeders have begun to recognise that selection for increased resistance to nematode infection has an important place in their genetic improvement programmes.

There is some evidence and speculation that the magnitude of within- and between-breed variation for resistance to nematode parasites, including *Haemonchus contortus*, may be similar (Gray *et al.*, 1987). Since the New Zealand sheep industry is dominated by several dual-purpose breeds there may be opportunities to use different parasite-resistant genotypes in breeding and animal production programmes to assist in delaying the emergence and spread of anthelmintic resistance and meet demands to reduce applications of animal health remedies to stock.

The current study was designed to examine sire and breed variation within and between Romney (R), Perendale (P) and RxP crosses in expression of resistance to natural mixed internal nematode parasite infection as measured by FEC.

#### MATERIALS AND METHODS

Ram progeny born during 1989 into the Landcorp Farming Ltd. performance recorded flocks at Wakelins in Northland were used for the study. Complete performance data were recorded for lambs from 4 Perendale, 4 Romney and 7 RxP single sire matings.

At commencement of the trial in January 1990, all lambs were drenched with anthelmintic. Thereafter they were grazed as one mob. A small subsample of animals was selected at random to act as sentinel monitors. Rectal faecal samples were collected from these monitor lambs at weekly intervals beginning 14 days after drenching to assess levels of infection within the flock. No further drenching was undertaken until the mean FEC for the monitors reached 1000-1500 eggs per gram faeces (epg). At this trigger level all lambs were faecal sampled; samples were identified by lamb tag number; and anthelmintic was administered. A second round of monitoring commenced 14 days later. Full faecal sampling and drenching was repeated once the trigger level was reached. Surplus faecal material was bulked by breed for faecal culture to determine the predominant nematode species at each full sampling.

Data were analysed by least squares means using Genstat (1988) fitting fixed effects of sire and breed independently. Square root transformations were applied to normalise the distributions of both FEC. Half-sib heritabilities were determined across breeds from restricted maximum likelihood (REML) estimates (Patterson and Thompson 1971).

#### RESULTS

Flock records, including FEC1 and FEC2, were available from 779 ram lambs (216 Perendale, 221 Romney, 342 Crosses). Only animals with complete records were used for the analyses.

Full faecal samplings were undertaken on 12 February (FEC1) and 12 March (FEC2) 1990. Progeny FEC means by sire and breed are summarised in Table 1. Age of dam, lamb birth date and birth rank did not significantly affect FEC. Both sire and breed had significant effects on FEC1 and FEC2. *Ostertagia* spp. was the predominant nematode recovered from the faecal cultures at both sampling times.

Heritabilities(S.E.) for FEC1 and FEC2 were 0.15(0.09) and 0.15(0.10), respectively.

**TABLE 1** Sire group progeny geometric least squares mean faecal nematode egg counts\* (EPG).

Breed	Sire	N	FEC1	N	FEC2
Perendale	304.87	43	3,422	34	2,842
	367.87	58	2,741	38	2,170
	650.87	52	4,118	35	3,196
	748.87	52	3,869	31	1,700
Mean		205	3,560	138	2,535
Romney	9.86	48	4,032	36	3,502
	116.86	53	5,641	35	4,827
	281.87	56	4,031	48	2,511
	989.87	46	5,423	37	4,264
Mean		203	4,757	156	3,737
Cross	65.86	53	3,677	49	3,829
	278.86	53	3,344	44	2,822
	309.85	38	5,132	36	3,245
	344.86	50	3,605	35	2,581
	348.85	36	3,080	31	2,535
	397.86	28	5,004	27	3,055
	1,029.87	49	3,866	44	3,160
Mean		307	4,073	266	3,242
Source of Effect					
Breed (RSD)			***(697)		**(571)
Sire (RSD)			***(615)		**(557)

\* Back-transformed square root (FEC); RSD = Residual Standard Deviation; \*\*\* =  $P < 0.001$ ; \*\* =  $P < 0.01$ .

## DISCUSSION

Genetic studies with Romney or Perendale sheep have previously demonstrated significant sire variation in progeny FEC (Baker *et al.*, 1991, Watson *et al.*, 1992). Furthermore, studies have also revealed that FEC of lactating Romney and Perendale ewes selected for high or low FEC as lambs consistently reflects the direction of selection (Watson and Hosking 1991). Even so, direct comparisons between the two breeds have provided inconsistent results. Although the present study, in terms of a breed comparison, is limited by the numbers of sires the results indicate that Perendales had significantly fewer eggs/g in their faeces than Romneys or crossbreds while grazing together.

Heritabilities estimated from these data are somewhat lower than other reports and is probably related to the small number of sires. Both sire and breed significantly affected progeny FEC in the present trial. Even though pasture larval availabilities were not assessed, the range observed for FEC across the 3 genotypes 0-21,500 epg and the short duration between samplings suggests that considerable contamination was encountered throughout the project. Perendale progeny had significantly lower FEC than their Romney counterparts, with cross-bred progeny being intermediate. This status for FEC of cross-bred sheep was also seen by McSporran and Andrewes (1988) in their comparison of the Polled Dorset and Perendale breeds.

Historically, investigations of relative differences in susceptibility to parasites between different breeds in New Zealand have provided inconclusive results. Preliminary studies conducted in the early 1980's suggested that grazing RxP lambs developed significantly lower FEC than Romneys of similar age (Brunsdon and Bruin 1981-82). Subsequently, Brunsdon (1982-83) found no significant differences in FEC between Romney,

Perendale or RxP cross bred sheep grazing together. Lack of consistency in results of earlier studies with Perendale and Romney lambs between successive years was explained by major annual differences in levels of parasite challenge. It is quite possible that other factors, such as nutrition and nematode species may also have contributed. As with many breed comparison studies of this type conducted overseas (see review by Gray 1987) supporting information, such as numbers of sires, and nutritional levels, were not indicated.

More recently, McSporran and Andrewes (1988) demonstrated significant differences in FEC between Polled Dorset and Perendale ewes during lactation. The former breed had higher FEC in the autumn but not during spring. They suggested that seasonal differences in expression of FEC was related to lower larval challenge from pasture during the spring.

The current findings that both sire and breed affected FEC is not unique. Gray (1991) summarised approximately 35 'breed comparisons' which involved numerous breeds exotic to the New Zealand sheep industry. In his review, Gray noted that there was enough evidence to suggest that variation within- and between-breeds was probably similar. On that basis and given the current findings, breeders and producers using different genotypes may take advantage of both sire and breed effects to identify 'elite' rams and ewes with increased resistance (low FEC) to internal nematodes. Widespread use of superior animals can be expected to assist with parasite control programmes designed to reduce the frequency of anthelmintic applications and delay the development of drench resistance.

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