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Long-term effects of sheep body lice (*Damalinia ovis*) on body weight and wool production

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Abstract The effects of sheep lice on their hosts were monitored by comparisons between a lousy flock and a louse-free flock over 3 years from when the sheep were 4 months old. Lice had no significant effect on host body weight or greasy wool production. Lambing percentages and lamb weights at weaning also appeared to be unaffected. Although scoured wool yields from the lousy flock were reduced by 2.6% (mean) over 4 shearings in comparison with the louse-free flock, greasy fleece weights individually corrected for yield, using mean yields, did not differ significantly.

Keywords Sheep; lice; *Damalinia ovis*; wool; lambs; weight gain; weight losses; parasites

INTRODUCTION

Sheep lice are considered to be one of the most important pests of sheep in New Zealand (Emberson 1976). This belief is reflected in their being the only parasites, along with sheep ked (*Melophagus ovinus*), for which annual remedial treatment is compulsory. Lice are reported to cause ill-thrift and wool damage (Helson 1974, Emberson 1976) and to chew through wool fibres (Cameron 1951). Helson (1974) claimed that the irritation caused by lice stunts the growth of young animals and predisposes them to disease by lowering their vitality.

Kettle & Pearce (1974) demonstrated that wool quality, subjectively assessed, is reduced by the activities of lice. In the trial reported here, the long-term effects of lice on wool quantity, body weight gain, lambing percentages, and lamb growth up until weaning were examined.

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MATERIALS AND METHODS

The trial was run on the Wairarapa Cadet Training Farm, near Masterton.

One hundred shorn Border Leicester-Romney X ewe lambs were divided into 2 evenly matched groups of 50 by visual assessment of size on 14 December 1977. All animals were ear-tagged and on 22 December one group (lousy) was confined overnight with a flock of known infestors. The second group (louse-free) was treated with Diazotas® (diazinon, 1:500) using a back spray on 11 January 1978 and a plunge dip on 2 February 1978. Plunge dipping was subsequently carried out in February in the succeeding 2 years. Both groups were drenched monthly from January to October inclusive with Nilverm® .

The 2 groups grazed 2 replicate suites of pastures and were moved between paddocks at approximately weekly intervals.

At intervals, all sheep were weighed and a sample from each was examined for lice using the louse index of Kettle & Pearce (1974). Alternate halves (25) from each group were assessed for lice up until November 1978 when the number assessed was reduced to 15 from each group, selected at random. Analysis of louse indices before November 1978 suggested that a reduction in numbers handled would not impair the accuracy.

The interval between examinations was approximately monthly throughout except over the periods between lambing and weaning in 1979 and 1980 when there was, on each occasion, a 3-month gap.

The sheep were shorn on 29 September 1978, 14 March 1979, 14 December 1979, and 12 December 1980. The wool clip from the lousy and louse-free groups was baled separately on each occasion. Core samples (20/bale) were collected using a manual corer.

Each group was tupped by a different Southdown ram confined with it during the early autumn of 1979 and again in 1980.

Lambs were counted, examined for lice, and weighed at weaning. Barren ewes were noted at weaning and their body and fleece weights were excluded from the general data for that year as their body and fleece weights were abnormally high.

Scoured wool yields were determined at the Wellington Laboratory of the New Zealand Wool Testing Authority to International Wool Testing Authority Standard 19–76. In order to determine

Table 1 Comparison of greasy and scoured wool production from lousy and louse-free sheep.

	Shearing dates			
	29 Sep 1978	14 Mar 1979	14 Dec 1979	12 Dec 1980
Mean greasy fleece weights (kg)				
Louse-free	2.94	2.05	2.71	3.63
Lousy	3.02	2.30	2.89	3.87
Significance‡	NS	>99%	NS	NS
Mean scoured fleece weights corrected for yield†				
Louse-free	2.18	1.86	2.22	2.92
Lousy	2.07	2.05	2.32	2.98
Significance‡	NS	NS	NS	NS

† 16% regain of moisture;
‡ Students t-test.

Table 2 Ewe and lamb numbers, lambing percentages, and lamb body weights.

		Weaning dates	
		14 Dec 1979	12 Dec 1980
Total no. of ewes	Lousy	46	45
	Louse-free	49	45
Ewes which lambed	Lousy	37	41
	Louse-free	38	43
No. of lambs weaned	Lousy	34	43
	Louse-free	40	42
Mean lamb body weights (kg) at weaning (12 weeks)	Lousy	19.5	20.1
	Louse-free	19.6	20.0
Significance (Student's t-test)		NS	NS

whether sheep lice gripping the wool fibres were causing damage, shoulder wool samples from lousy and louse-free sheep were compared with a scanning electron microscope (SEM).

RESULTS

Over the first year, sheep body weights differed considerably but there was no evidence of lice having an effect on host body weight (Fig. 1). The factors responsible for the observed variation are not known but they were of short-term importance only and did not correlate with louse numbers. Differences in weights were greatest during the first year and differed significantly ($P<0.05$) only twice over the following 2 years — once in favour of the lousy groups and once the louse-free.

Greasy wool production (Table 1) in lousy sheep was higher but the difference was only statistically significant ($P<0.01$) at the second shearing when it may have been the result of the depressing effect of the louse-free group having been plunge-dipped the previous month. This operation could possibly have had a depressing effect on wool growth or removed material from the fleece. The scoured yield data indicates that removal of suint, dust, and debris from the fleeces was not responsible for the weight differences as the yield from the lousy fleeces was significantly higher than that from the louse-free. No satisfactory explanation for these findings can be offered but even with this figure included the mean scoured wool yield from lousy sheep, for all shearings, was 2.6% less than from the louse-free. However, when greasy fleece weights were individually corrected for yield, using mean yields, the total amount of wool fibre produced by the lousy and louse-free mobs was found not to differ significantly.

There was no significant difference in lambing percentage between groups (Table 2). Also, on the basis of weight at weaning, lambs were not adversely affected by being lousy from an early age (Table 2).

The seasonal pattern of lousiness, shown for the first year in Fig. 1, remained basically similar throughout the trial period with highest indices in late winter. The mean winter peak rating was 17 for the first year and reached 10 during the succeeding 2 years. In pregnant ewes the peak extended at least until August whereas a decline was already evident by then in non-breeding sheep over their first winter. SEM examination of lousy wool revealed "little, if any, surface damage" to the fibres (Orwin, D. F. G., pers. comm.).

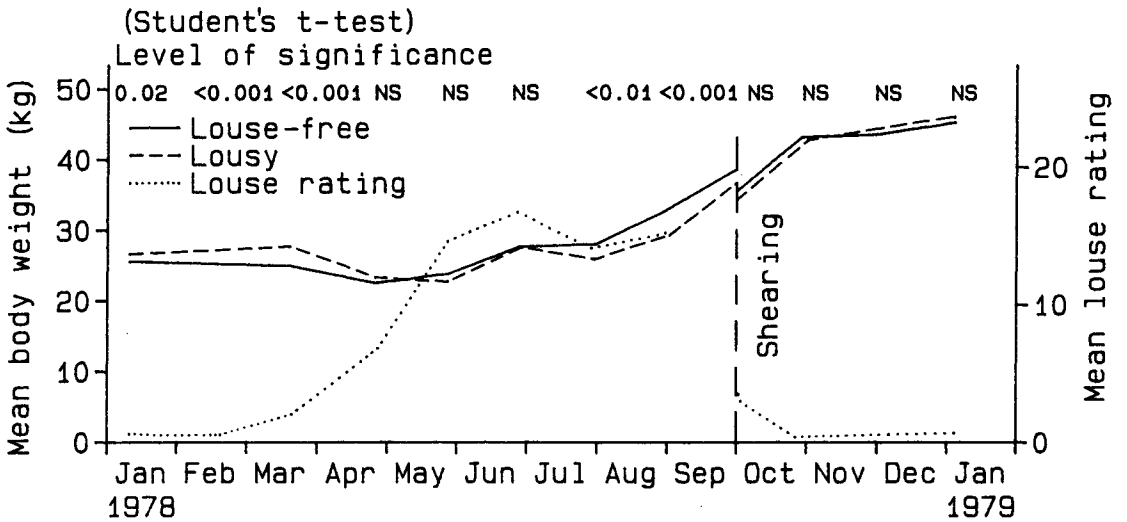

Fig. 1 Mean body weights and louse rating of ewes during 1978.

DISCUSSION

The sheep in this trial were severely stressed through lack of food over the summer months, particularly during their first summer, and developed heavy louse burdens over winter, but despite this there was no significant effect on host body weight. Lousiness over the first winter was considerably greater than that previously found in the region by Kettle & Pearce (1974 and unpublished data) but was similar to the levels they found in the second and third years. The results from this trial verified the effects on body weight reported by Kettle & Pearce (1974).

The claim that lice cause ill-thrift is probably based on observations of heavy louse burdens on sheep concurrently suffering from some other condition such as parasitic gastro-enteritis. The situation appears to parallel that in cattle where, usually, lice indicate rather than cause ill-thrift in winter (Kettle 1974). Monthly drenching during the first 10 months of the present trial ensured that nematodes did not severely affect the sheep.

Louse damage of sheep appears to be restricted to the fleece (e.g., Kettle & Pearce 1974, Lipson & Bacon-Hall 1976) and, perhaps, the skin. The belief that damage is direct (Cameron 1951) is probably false. Waterhouse (1953) found that sheep lice do not live on a diet of wool but feed on skin debris and yolk. Ewing (1936) suggested that within Trichodectidae (which includes *Damalinia*) louse size is related to the size of its oral groove. This groove, in conjunction with the mandibles, acts on the hair or wool as an efficient "hold-fast" organ preventing removal of lice by the host's grooming activity. The possibility of this activity harming the wool fibres appears to have been excluded as the SEM examinations revealed no damage.

It appears that changes in wool quality and damage, if any, are indirect and result from the irritation caused by lice. Irritation may induce host responses such as rubbing, scratching, and biting and these activities adversely affect the fleece. In addition, there is evidence, from this trial, that irritation may stimulate the skin to increase suint and yolk production. This is inferred from the relatively lower scoured yields in the lousy sheep, mean difference in this instance being a 2.6% reduction over all shearings.

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