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MANAGEMENT FACTORS AFFECTING PARASITISM AND PRODUCTION OF PRIME LAMBS

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Summary

When nematode infection was controlled by anthelmintic treatment, prime lambs from ewes stocked on sown pasture at 10 ewes/ha reached marketable weights (30-34 kg) at 14-18 weeks of age. Untreated lambs carried an average of 5,000 , worms, which did not significantly affect liveweight production. Lambs from ewes stocked at 20/ha required an additional 14-15 weeks to reach 30-36 kg and by this time untreated lambs had mean worm counts of 20,000 and liveweight production loss was 4-6 kg ($P < 0.001$).

Application of nitrogen fertilizer to lambing paddocks of sown pasture had no effect on levels of parasitism in lambs. At stocking rates of 10 and 15 ewes/ha the live weights of lambs were lower ($P < 0.01$) in the fertilized than in the control paddocks.

I. INTRODUCTION

Management factors considered to affect the degree of parasitism and consequently the growth of lambs reared for the prime lamb market, include anthelmintic treatment, stocking rate (Spedding et al. 1967), and nitrogen fertilizer application (Cameron 1965, Cameron and Gibbs 1966).

In the present study these three factors have been re-examined. In addition the interaction of anthelmintic and stocking rate on lambs born at the onset or conclusion of a normal lambing period was investigated.

II. MATERIALS AND METHODS

The experiments were conducted in two consecutive years (1968-69) at the C.S.I.R.O. Pastoral Research Laboratory, Armidale, N.S.W. on an area of phalaris, ryegrass, and white clover pasture.

(a) Experiment1 - 1968

A flock of Merino ewes was joined with Border Leicester rams wearing raddle harnesses. After eight days the rams were withdrawn and the marked ewes constituted the early lambing group (mid point of lambing, 5th August). Three weeks later the flock was rejoined and ewes marked during the first eight days were selected for the late lambing group (mid point of lambing 5th September). All ewes were then run together and 14 days before lambing was due to commence were randomly allocated to the experimental treatments and paddocks. The 2 ha paddocks carried 40 ewes at the high and 20 ewes at the low rate of stocking. Once before lambing and thereafter at 14 day intervals ewes and their lambs in the anthelmintic treatment groups were dosed alternately with thiabendazole (44 mg/kg) and tetramisole (7 mg/kg). There were three replications.

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TABLE 1

Mean total and generic composition of lamb worm counts

Stocking rate	Time of lambing	Total	Number of worms: Abomasum H.*	Abomasum O.**	Small intestine T.‡	Small intestine N.‡‡
		1968				
Low	Early	4610	23	979	32	3516
	Late	5218	33	1143	29	3952
High	Early	18632	1183	1978	12277	3089
	Late	20547	1666	1900	15547	1231
	Nitrogen	1969				
Low	+	13206	3102	8370	1439	274
	0	9687	1811	5947	1577	322
High	+	8952	2180	4678	1615	460
	0	10118	1895	4574	2643	983

* Haemonchus ** Ostertagia ‡ Trichostrongylus ‡‡ Nematodirus

TABLE 2

Weights, dressing percentage, and skin weights of lambs

Stocking rate	Time of lambing	Anthelmintic	Live Weight kg	Gain/day kg	Chilled carcass kg	Skin kg	Dressing %
		1968					
Low	Early	+	34.6	0.24	15.4	3.7	47.7
	"	0	32.3	0.22	14.2	3.4	48.3
	Late	+	31.3	0.25	13.2	3.5	45.5
	"	0	30.2	0.24	13.0	3.2	47.1
High	Early	+	36.2(25.1)*	0.14(0.18)*	13.9	4.4	42.2
	"	0	30.2(23.4)	0.11(0.17)	11.0	3.9	40.1
	Late	+	33.3(22.6)	0.14(0.21)	13.1	4.0	43.7
	"	0	29.0(21.5)	0.12(0.20)	10.4	3.5	40.8
	Nitrogen fertilizer						
Low		+	26.8	0.28	12.5	2.8	50.6
		0	28.6	0.30	14.0	3.0	52.6
High		+	26.0	0.27	12.4	2.6	51.5
		0	27.2	0.29	12.6	2.8	50.0

* weights and gains for HSR lambs at time of slaughter of LSR lambs

(i) Pastures

The addition of nitrogen fertilizer caused a 40% overall increase ($P < 0.05$) in pasture availability at both stocking rates (+N 3200 kg Dry matter/ha, control 2285 kg-DM/ha). but halved the percentage of clover present (+N 8%, control 16%) and increased the percentage of ryegrass(+N 38%, control 24%). Other plant species remained almost unchanged.

(ii) Parasites

Ewe faecal egg counts remained low and comparable between-groups with a slight post parturient rise, the HSR control group exceeding 2,000 e.p.g. on one occasion. Lamb faecal egg counts rose rapidly, means at slaughter (12 weeks of age) being LSR t N 6,000 e.p.g., control 1,500 e.p.g., HSR + N 2,800 e.p.g. control 4,200 e.p.g.

Observations were made on ewe and lamb live weights and faecal egg counts. At slaughter, information was obtained on total worm counts, lamb carcase weight, dressing percentage and skin weight.

(b) Experiment 2 - 1969

There were two rates of nitrogen fertilizer application (Nil and 77.5 kg/ha) two rates of stocking (10 and 15 ewes/ha) and two replications. No anthelmintic treatment was given. The sheep were first cross Border Leicester x Merino ewes joined with Dorset Horn rams. The paddocks each of 1 ha carried ten ewes at the low stocking rate (LSR). The high stocking rate (HSR) groups consisted of ten experimental ewes plus eight wethers which had the live weight equivalent of five ewes. The main observations and techniques were similar to those in Experiment 1. In addition, on three occasions, measurements were made of milk and butterfat production (Corbett 1968). Pasture dry matter was estimated by capacitance meter (Jones and Haydock 1970) in August, October and December, and botanical composition was determined in December.

III. RESULTS

(a) Experiment 1

Rainfall during the first period of the studies, August to December inclusive, was 85% of the 21 year average of 392.5 mm. In the second period from December through to March 1969 rainfall was 118% of the average of 280.2 mm; however 56% of this fell in a short period in January.

(i) Parasites

Although a post-parturient rise occurred, faecal egg counts of ewes in the untreated groups were generally below 1700 eggs per gram (e.p.g.) and only on one occasion did the mean count exceed 2,000 e.p.g. (LSR early). Until the time of slaughter of the LSR lambs mean faecal egg counts of all untreated lambs were less than 300 e.p.g. By mid February counts of the HSR lambs had risen to peaks of 7,400 e.p.g. (late) and 4,500 e.p.g. (early). At slaughter in March both groups had egg counts of approximately 5,700 e.p.g. Total and major species worm counts for untreated lambs are shown in Table 1.

In LSR lambs, Nematodirus spp. and Ostertagia spp., were numerically most important. In the older HSR lambs Trichostrongylus colubriformis was predominant and the proportion of Nematodirus spp. and Ostertagia spp. was much lower. Haemonchus contortus was not present in large numbers.

(ii) Production

Information on lamb productivity is summarized in table 2.

At the time of their slaughter the LSR lambs were significantly heavier ($P < 0.001$) and had grown faster ($P < 0.001$) than the HSR lambs. At this time, the late lambs had grown faster ($P < 0.001$) than the early lambs; the stocking. rate x time of lambing interaction was not significant. Before the HSR lambs had reached marketable weights, the growth rate advantage of the late lambs was no longer significant. Anthelmintic treatment had no effect on LSR lambs but produced significantly higher final live weights in HSR lambs ($P < 0.001$) and ewes ($P < 0.01$). The dressing percentage of the treated HSR lambs was also greater ($P < 0.001$).

(b) Experiment 2

Rainfall during the period of the study, August to December inclusive, was 102% of the 21 year average of 392.5 mm.

Results of post morten worm counts, from 24 lambs from each treatment are included in table 1. Similar low to moderate infestations of Haemonchus contortus and Ostertagia spp. were present in all groups.

(iii) Production

Nitrogen fertilizer had no significant effect on the milk production of the ewes. A reduction (+ N 133 g, control 182 g, $P < 0.05$) in their butterfat production per 24 hours was recorded when the lambs were approximately three weeks of age.

Information on lamb productivity is included in table 2.

At both LSR and HSR nitrogen fertilizer application reduced lamb live weight at slaughter ($P < 0.01$), carcase weight ($P < 0.01$), and rate of gain ($P < 0.05$), but not dressing percentage. There were no significant differences in ewe live weights.

The LSR lambs were heavier ($P < 0.05$) in both live and carcase weight than the HSR lambs but the dressing percentage was not affected.

IV. DISCUSSION

(a) Experiment 1

The suppression of parasites by the use of anthelmintic showed no live weight advantage for lambs grazed at either the low or high stocking rate up to an age of 18 weeks in December. Donnelly, McKinney and Morley (1972) showed that anthelmintic treatment of flocks prior to and/or shortly after lambing had no effect on lamb growth to 12 weeks (approx. 21 kg live weight at their LSR). Results of this experiment indicate that parasitized lambs, remaining with their dams, may be carried through to marketable live weights (30-34 kg) at 14-18 weeks of age without significant production loss. However at the HSR the extended grazing period exposed the lambs to a greater risk of nematode infection so that by the following March the untreated HSR lambs had average worm burdens of 20,000 and live weight and carcase weight was significantly reduced.

Major and Royal (1974) have shown a significant effect of nematode infection on lamb carcase weight without an effect on live weight at 20 weeks of age.

Faecal egg counts of LSR and HSR lambs when they were 14-18 weeks old were similar and probably reflected similar worm burdens (about 5,000) in each group.

Stocking rate in itself had no effect on the level of parasitic infection but rather the quantity and quality of the forage available probably limited growth of the HSR lambs. The results of Spedding et al (1967) also indicated that as stocking rate increased nutrition rather than disease or parasitism would be the principal limiting factor.

The numbers of Nematodirus spp. recovered at autopsy from the HSR as compared to the LSR lambs probably indicates the development of resistance to this species early in the life of the lamb as reported by Brunsdon (1963).

(b) Experiment 2

Nitrogen fertilizer application did not produce any significant differences in the total number, or species composition of worms recovered

at post mortem. Cameron and Gibbs (1966) reported that numbers of Trichostrongylus spp. decreased with an increase in the rate of nitrogen application. The reason for this decline was obscure because nitrogen applications were confounded with an increase in stocking rate.

At both stocking rates nitrogen application increased the total forage available and reduced the percentage of clover in the sward. The consequent effect was a significant reduction in liveweight gain of the lambs, though not of the ewes. The lambs may have been unable to utilize the grass dominant pasture as efficiently as the mixed grass clover sward (Rae, Brougham, and Barton 1968) or the result may reflect the effect of the pasture composition on the trend towards a decline in butterfat production of the ewes.

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