OVERBERG RESEARCH PROJECTS. X. THE EPIDEMIOLOGY OF HELMINTHS IN EWES AND LAMBS IN THE SOUTHERN CAPE PROVINCE DURING AUTUMN

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ABSTRACT

Nematode parasite burdens of ewes grazing on grass/lucerne pasture, increased 58-fold after the first autumn rains in the southern Cape Province. Lambs were infected before the age of 8 weeks and harboured large burdens of nematode parasites before the age of 14 weeks. *Oestrus ovis* infections were present in 96% of the ewes, while 92% of the lambs above the age of 3 weeks were infected. Anthelmintic treatments in autumn, winter and spring are recommended for controlling parasites of sheep in this region.

Key words: Epidemiology, sheep, helminths, autumn.

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INTRODUCTION

Epidemiological studies on the nematode parasites of sheep in the Rûens region of the southern Cape were conducted in an area where no significant rain fell before April[9 10]. The dryland legume pastures in that area are unproductive during summer and autumn, and sheep on the majority of farms are grazed on harvested wheat fields until winter. Conditions on the wheat stubble were unfavourable for the survival of infective nematode larvae in the hot, dry summer. However, the eastern part of the Rûens region which forms the transition from a winter rainfall to a non-seasonal rainfall area, is known to receive substantial quantities of rain in autumn, and the dryland legume pastures can be grazed by the sheep in autumn. The epidemiology of nematode parasites of sheep grazing on these pastures in autumn, was unknown and warranted investigation after it was determined that nematode parasites were rife on similar legume pastures grazed by sheep during winter[9 10]. For this purpose a trial was conducted in ewes and lambs on the farm Vaalplaas, east of Caledon.

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MATERIALS AND METHODS

The farm Vaalplaas where the experiment was conducted, lies approximately 7 km east of Caledon (34° 15'S, 19° 28'E) in the Rûens region of the southern Cape Province. A small paddock of approximately one hectare close to the homestead, was used for the experiment. During the summer of 1987 the paddock was used as a loafing yard for dairy cows. Prior to that, it was grazed by sheep. During the autumn of 1988, the paddock was ploughed and sown to grass and lucerne and kept free from animals until the experimental animals were placed on it on 21 February 1989.

The rainfall and temperature data presented in Fig. 1 were recorded by the Agrometeorology Section of the Department of Agricultural Development at a weather recording station on an adjacent farm, Dunghye Park.

On 21 February 1989, a group of pregnant ewes (n = 18) was transferred to the experimental paddock. As the ewes lambed, each ewe and her lamb were eartagged and later slaughtered as a pair. Six ewes which had given birth to stillborn lambs, were slaughtered on 21 February 1989 and served as indicators of the helminth infection present in the ewes at the time of their transfer to the experimental paddock.

Trial schedule:

20 September - 5 October 1988 - Exposed ewes to teaser rams.
6 October - 15 November 1988 - Ewes mated.
21 February 1989 - Slaughtered 6 ewes as indicators and transferred 18 pregnant ewes to the experimental paddock.
15 March - 15 April 1989 - Lambing period.
4 April 1989 - Slaughtered 6 ewes and lambs.
16 May 1989 - Slaughtered 6 ewes and lambs.
27 June 1989 - Slaughtered 6 ewes and lambs.

The ewes were treated with ivermectin in December 1988, whereafter neither ewes nor lambs received any further anthelmintic treatments. All animals selected for necropsy were starved for 24 h, slaughtered and the heads and gastro-intestinal organs removed for processing. The abomasum, small intestine and caecum and colon were each ligated with string, separated, placed in labelled plastic bags, transported to the laboratory and processed as follows:

Abomasum: The ingesta and washings of the abomasal wall were collected in a bucket, fixed with formalin, washed on a sieve with apertures of 38 micrometer and the washed ingesta preserved in a labelled glass jar. The wall of the abomasum was then cut into small pieces and placed in a labelled glass jar containing 3% HCl, incubated at 40°C for 20 to 24 h, washed on a 38 micrometer sieve, the washings collected in a labelled jar and preserved in 10% formalin.

Small intestine: the ingesta and washings of the small intestinal wall were collected in a bucket, fixed with formalin, washed on a 38 micrometer sieve and the washings collected in a labelled jar and preserved.

Table 1: Mean worm burdens of 6 ewes slaughtered at different times of the year

Slaughter date	Teladorsagia L3	Teladorsagia L4	circumcincta	trifurcata	Total	Nematodirus L3	Nematodirus L4	spathiger	abnormalis	Total	Trichostrongylus L3	Trichostrongylus L4	colubriformis	rugatus	falculatus	axei	Total	All Other	Nematode immature	Total adult	Total	Oestrus ovis 1st	Oestrus ovis 2nd	Oestrus ovis 3rd
21/2/89	205	259	369	0	633	19	84	0	301	224	38	22	0	135	0	0	145	1	470	531	1001	7	8	5
4/4/89	8897	15253	2945	0	27095	237	543	662	398	1182	58	1281	0	2633	6693	2395	11025	30	26190	13142	39332	14	4	12
16/5/89	1583	5585	8975	3529	19084	329	677	0	408	778	157	1609	6959	3470	3906	155	15253	0	9068	26050	35118	17	1	2
27/6/89	9803	42166	1909	416	52452	613	585	0	0	687	408	338	16141	1265	10020	866	28698	0	51428	30413	81841	19	2	7

Table 2: Mean worm burdens of 6 lambs slaughtered at different times of the year

Slaughter Date	Teladorsagia L3	Teladorsagia L4	circumcincta	trifurcata	Total	Nematodirus L3	Nematodirus L4	spathiger	abnormalis	Total	Trichostrongylus L3	Trichostrongylus L4	colubriformis	rugatus	falculatus	axei	Total	All Other	Nematode immature	Total adult	Total	Oestrus ovis 1st	Oestrus ovis 2nd	Oestrus ovis 3rd
4/4/89	0	30	10	0	7	0	0	10	0	2	0	0	0	100	0	0	17	0	5	20	25	0	0	0
16/5/89	192	244	998	802	1533	72	57	310	257	470	0	110	289	408	0	0	481	0	387	2097	2484	12	0	0
27/6/89	6433	26807	21621	2892	56681	498	720	1726	717	2731	776	6494	10612	20012	41053	363	78929	14	39944	98409	138354	19	2	1

Caecum and colon: The ingesta and washings of the wall of these gastro-intestinal organs were collected in a bucket, washed on a 150 micrometer sieve and the washings collected in a labelled jar and preserved in 10% formalin.

When a preliminary rough estimate of the total number of worms present in the ingesta and digesta of the abomasum and the ingesta of the small intestine indicated a worm burden in excess of 2 000 worms in a given organ, all the worms in 4 aliquots of one percent were counted under a stereoscopic microscope, otherwise 4 aliquots of 5% were processed. Approximately 30 male worms and 30 larvae were removed from each sample of ingesta for identification under a compound microscope. The ingesta of the large intestine were examined macroscopically in toto and the worms counted and identified.

For the recovery of *Oestrus ovis* larvae from the slaughtered animals, the heads were split sagitally with a saw and the nasal cavities and sinuses opened with a pair of side-cutters. The larvae were then removed and counted with the aid of a hand lens.

RESULTS

The mean monthly temperatures and the total monthly rainfall recorded on the neighbouring farm during the trial period, are presented in Fig. 1. The rainy season commenced with a precipitation of 17 mm on 13 March 1989 and 46,5 mm on 30 March 1989. The mean number of each stage of the different parasites recovered from each group of 6 animals are presented in Table 1 (ewes) and Table 2 (lambs). The geometric means of the total worm burdens of the different groups of ewes and lambs which were slaughtered, are presented in Fig. 2.

Within a period of 3 months, from 4 April to 27 June 1989, the worm burdens of the lambs increased to a geometric mean of 82 122, with the major increase occurring during the last 6 weeks (Fig. 1). The highest individual worm burden recorded from the lambs was 246 681 and from the ewes 182 437. The worm burdens of the lambs and ewes slaughtered on 27 June 1989 did not differ significantly ($P > 0,05$). Only one (4%) of the ewes in the trial, and a single lamb (8%) among those killed on or after 16 May 1989 did not harbour any *Oestrus ovis* larvae.

DISCUSSION

The group of ewes slaughtered on 21 February 1989, indicated that the ewes harboured very few worms (595) when they were initially placed on the experimental paddock. After 6 weeks, on 4 April 1989, the mean worm burden of the

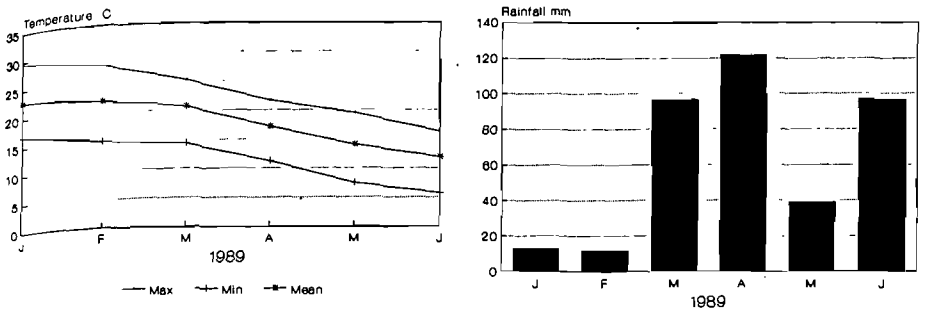

Fig. 1: **Mean monthly temperatures (°C) and total monthly rainfall (mm) recorded at Dunghye Park during 1989**

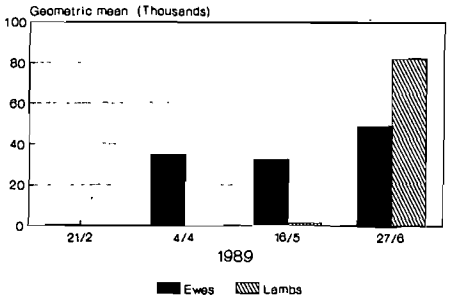

Fig. 2: **Geometric means of the worm burdens of groups of ewes and lamb slaughtered**

6 ewes slaughtered was 34 769, representing a 58-fold increase in the worm burdens of the second, compared to the first group of ewes (Table 1). The majority of these worms were undoubtedly acquired on the paddock. The lambs became infected with nematode parasites before the age of 8 weeks and harboured large parasite burdens before the age of 14 weeks.

It was not possible in the present trial to determine the source of infection responsible for the explosion in the worm burdens of the animals. The residual infection present in the ewes when they were placed on the experimental paddock, represented one probable source. Boag & Thomas[5] regarded such auto-infection as the most important source of infection to the grazing animal. Furthermore, Boag & Thomas[4] determined that worm eggs deposited during autumn, developed into infective larvae more rapidly and in larger numbers than those deposited during winter. Epidemiological studies in the Rûens region indicated that very large numbers of worm eggs were indeed deposited on the pastures in autumn[10]. In a similar Mediterranean-type climate, where pastures are naturally decontaminated by the hot and dry conditions in summer, Anderson[1] produced safe grazing for autumn and winter by treating animals early, and again late in the summer. Infective nematode larvae may, however, persist on the pasture for long periods of time. Besier & Lyon proved that nematode larvae and eggs can survive the Mediterranean summer in the faecal pellet[3]. Furthermore, Kates[8] rated infective larvae of *Teladorsagia* and *Nematodirus* the most successful (among the species tested by him) in surviving on pastures. *Teladorsagia* larvae are found in the soil[2] and can migrate to the surface through substantial layers of soil[7]. In the present study, the source of the large numbers of *Trichostrongylus falculatus* and *Trichostrongylus colubriformis* recovered from the ewes slaughtered from the experimental paddock, could not be determined (Table 1). Auto-infection was unlikely because none of the ewes slaughtered as indicators on 21 February 1989, when the remaining experimental animals were placed on the paddock, harboured any of these nematodes. If the pasture had been the source of these infections, infective larvae must have survived in the soil for approximately 18 months.

Nematodirus is a common parasite of sheep in the region, but develops into adult worms only in young animals[9 10 11]. While the results of the present study are in general agreement with those observations (Table 1 & 2), 11 of the 18 ewes slaughtered from February to May 1989 did harbour adult *Nematodirus* (Table 1). Periparturient relaxation of resistance in the ewes probably temporarily interfered with the process which usually prevents these parasites from maturing in adult animals.

Immature *Teladorsagia* have been shown to accumulate in sheep during winter and spring in this region, apparently owing to hypobiosis[9 10]. An accumulation of immature *Teladorsagia* in the sheep during winter was also noticed in the present trial and in the ewes and lambs slaughtered on 27 June 1989, respectively, 96% and 57% of the population were in the immature stage.

The results of the present study indicate that, in addition to the winter and spring treatments suggested by Louw[9], an anthelmintic treatment in autumn is necessary for all sheep in those parts of the Rûens which receive rain in autumn.

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