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Effect of supplementary feeding on the gastrointestinal strongylid eggs shedding in grazing pregnant Merino ewes

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ABSTRACT

Sixty Merino ewes during 140 days of pregnancy were naturally infected by strongylids at grazing, but 30 animals were provided a barley supplement furthermore (400 grams per head day^{-1}). Faecal samples were collected every 20 days for analysis and by means of faecal cultures the genera of strongylids present were identified. Body weight and body condition scores were also recorded every 10 days. Results showed that liveweight and body condition scores were higher in supplemented group than unsupplemented one during study. Unsupplemented ewes showed the higher strongylid eggs elimination during early pregnancy and periparturient rise in late pregnancy; and during whole experiment showed higher infection percentages than supplement fed group. However, supplemented ewes showed from 100 days of pregnancy higher values of strongylid eggs output. An increase in parasite establishment resistance of supplemented ewes is suggested and epidemiological implications will be discussed.

KEY WORDS: pregnant ewes, barley supplement, strongylid eggs

INTRODUCTION

Helminth parasites are a major cause of economic loss in ruminants throughout the world. The effects on productivity will be influenced by the species of nematodes, the age, immunological and nutritional status of the host

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(Sykes, 1994). Gastrointestinal nematode disease usually appears like chronic subclinical infections in sheep, but lambs and ewes under productive stress may be severely affected and show clinical sign such as diarrhoea and progressive loss of condition and body weight (Coop, 1982). It was reported that lambs on a low protein or low phosphorus diet may show more severe clinical signs, and the effect on liveweight and carcass composition changes are more important (Parkins et al., 1989; Symons, 1989). In the majority of these studies lambs without previous immunological experience and single or triple infected with strongylids are used, but there is a lack of research in older productive sheep.

Supplements are used under grazing conditions with the aim to improve forage utilization, provide supplemental nutrients, improve animal performance or provide additional carrying capacity (Lusby et al., 1987). In temperate areas there are great variations between the nutritive value and supply of sward offer during the year. Offering supplement to grazing sheep could diminish the quality and quantity herbage deficit in unfavourable seasons (Vallentine, 1990). The benefits from supplementation may be substantial during these stress periods (severe winter, drought, extreme weed infestation and heavy stocking rates), but under more favourable conditions the usefullness of supplementation programs should be closely monitored (Cochran et al., 1986).

The present research was undertaken to study the effects of supplementary feeding on the strongylid eggs elimination in grazing pregnant Merino ewes.

MATERIAL AND METHODS

Animals and management

Sixty 2-3 year-old pregnant Merino ewes were used. At the start of the experiment the mean liveweight of the ewes was 48 ± 2 kg. Three harnessed Merino rams were introduced to the flock following progesterone sponge withdrawal. The day of mating was recorded. All ewes were treated with anthelmintic 15 days before mating (albendazole, 10 mg kg^{-1} body weight, Valbazen™ 1.9%, Smithkline Beecham). Then, all animals were maintained indoors under worm-free conditions before the onset of the trial. On the 35th and 37th days after mating, pregnancy was determined by real-time ultrasonic scanning (Ote Biomedica Sim 4000 c, 5 MhzF).

After assessment of pregnancy, the ewes were divided randomly into two groups of 30 animals according to live bodyweight and body condition scores. All animals were under grazing condition in a semi-natural pasture composed of a mixture of *Lolium perenne, Festuca arundinacea* and *Trifolium repens*. One group was provided a barley supplement (400 grams per head day^{-1}) given once

early in the morning previous grazing. All animals grazed 12 h every day in 4500 m^2 fence plot (stocking rate: 1.3 ewes/ha) and at night they were maintained indoors together. The ewes acquired gastrointestinal nematodes naturally at grazing. The experimental period was 140 days (from January to May, 1995).

Sward height was estimated weekly from forty random measurements.

Every 10 days, the ewes were weighed and the body condition score was evaluated by two independent observers (Russel et al., 1969) prior to feeding.

Parasitological procedures

Faecal samples were taken from the rectum of all ewes every 20 days and the number of eggs were estimated by flotation of three grams of fresh faeces using saturated sodium chloride and the McMaster method (MAFF, 1977). Faecal egg counts were recorded as eggs per gram of faeces (epg).

Different genera of strongylid were identified by means of faecal cultures (MAFF, 1977) at 20, 80 and 140 days after the start of the experiment. Twenty grams of fresh faeces were broken up finely in a glass jar and incubated at 27°C during seven days. Larvae were recovered using the Baermann apparatus and stored in distilled water at 4°C until identification.

Statistical analysis

Results are shown as mean $\pm$ standard error of the mean (SEM). Faecal egg counts were transformed according to ln $(x+1)$ for calculation of means and stabilisation of the variances, then transformed back to their original scale to get geometric means. Differences between treatment groups were compared by analysis of variance.

RESULTS

As the ewes grazed, the initial sward heights (3.5 ± 0.3 cm) (range 1-6.5 cm) decreased and passed through the heights maintained under continuous stocking (2 ± 0.3 cm) (range 0.5-4.5 cm). Sheep acquired gastrointestinal helminths as subclinical infection without apparent clinical signs. Faecal examinations revealed strongylid eggs, but *Moniezia* spp. eggs were found in a low percentage of the animals.

Liveweight gains and body condition scores were lower in unsupplemented ewes than in supplemented ones during whole pregnancy (Figures 1 and 2).

In early pregnancy ewes showed a low median strongylid eggs output (0-15 epg), but unsupplemented group showed the highest values (Table 1 and Figure 3). At 100 days of pregnancy a faecal egg counts increase (periparturient rise) was

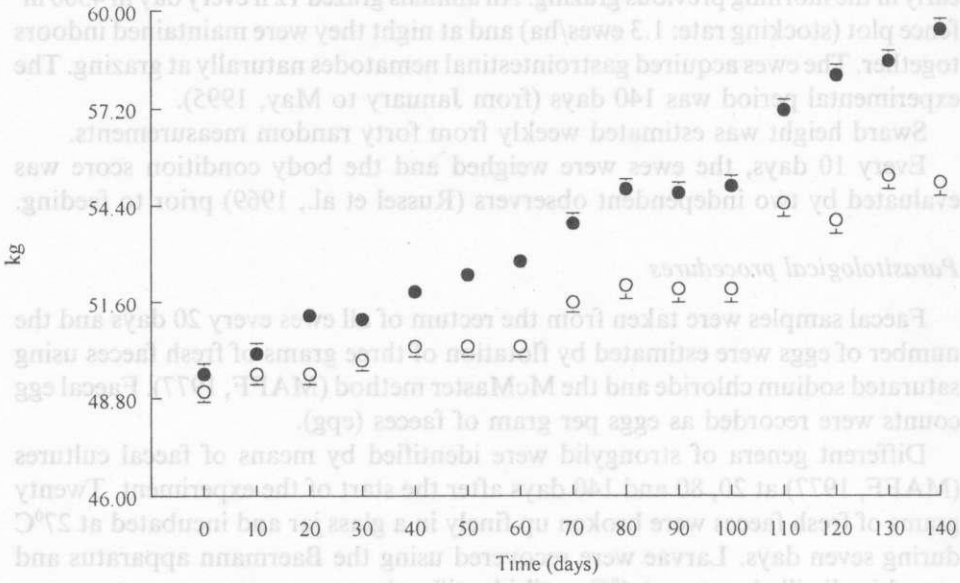

Figure 1. Body liveweight changes of supplemented (**o**) and unsupplemented (o) ewes during the pregnancy. Values means with their SEM represented by vertical bars.

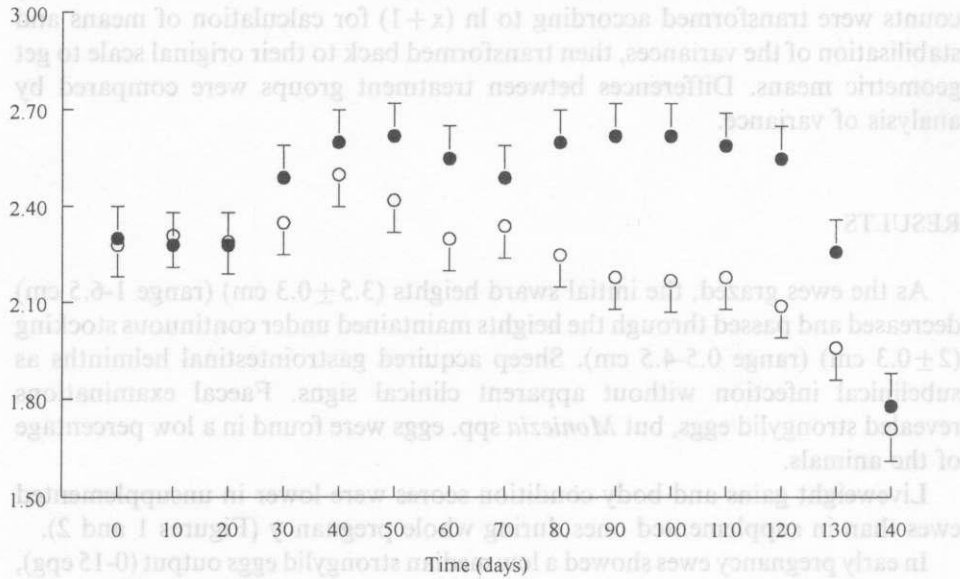

Figure 2. Body condition scores of supplemented (**o**) and unsupplemented (o) ewes during the experimental period. Means ±SEM are shown.

detected in both treatment groups (Figure 3). Supplemented ewes showed the increase of faecal egg counts earlier than unsupplemented ones, but at 120 days of pregnancy the highest epg values corresponded to grazing ewes without supplementation (Figure 3). At lambing faecal epg were similar in both dietary groups. The percentage of ewes infected by strongylids in both experimental groups are reported in Table 1. Unsupplemented ewes were infected as soon as 20 days of pregnancy and during all experimental period showed the highest values.

TABLE 1

Percentage of infection, median and range of strongylid eggs elimination in supplemented and unsupplemented ewes

Time (days	Supplemented ewes		Unsupplemented ewes	
	PI[a] %	Median epg[b] (range)	PI %	Median epg (range)
0	0	0 (0-0)	0	0 (0-0)
20	0	0 (0-0)	12	0 (0-15)
40	48	0 (0-465)	50	8 (0-1200)
60	30	0 (0-255)	64	15 (0-405)
80	42	0 (0-375)	52	15 (0-180)
100	69	75 (0-1125)	63	15 (0-405)
120	85	158 (0-915)	100	128 (15-720)
140	92	98 (0-990)	100	120 (15-570)

[a] percentage of infection

[b] eggs per gram of faeces

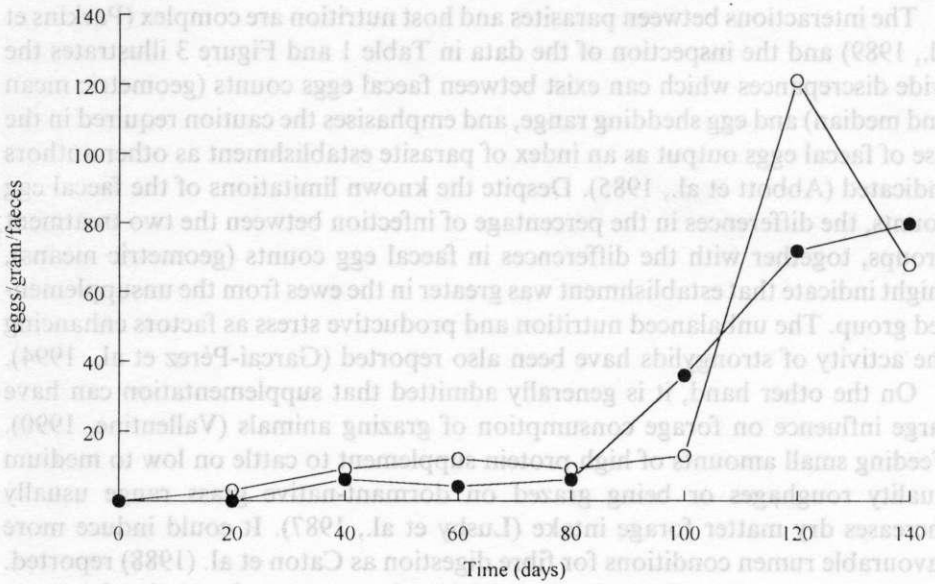

Figure 3. Geometric mean faecal egg counts in supplemented (o) and unsupplemented (o) pregnant ewes during the experimental period.

Strongylids found in faecal cultures were *Ostertagia* spp., *Trichostrongylus* spp., *Chabertia ovina*, *Cooperia* spp. and *Nematodirus* spp. The highest percentage of strongylids identified corresponded to *Ostertagia* spp. and *Trichostrongylus* spp., but no differences between treatment groups were found.

DISCUSSION

Barley supplement resulted in an improvement of productive parameters like body liveweight and body condition score, but no differences in the number of lambs born and their birthweight between dietary groups were found (A.R. Mantecón, unpublished data).

The results of present paper indicate that barley supplement may influence the strongylid eggs shedding in grazing pregnant Merino ewes. Thus, sheep were naturally infected by strongylids at grazing, but unsupplemented ewes showed strongylid eggs output earlier and their percentage of nematode infection during whole pregnancy was higher than in supplemented ones. The data obtained suggested that the supplemented diet could reduce parasite establishment compared with ewes at only grazing. However, some workers have indicated that the establishment of helminths, such as *Oesophagostomum columbianum* (Dobson et al., 1974), *Haemonchus contortus* (Abbott et al., 1985, 1986) and *Fasciola hepatica* (Berry et al., 1976), is not affected by the level of dietary protein.

The interactions between parasites and host nutrition are complex (Parkins et al., 1989) and the inspection of the data in Table 1 and Figure 3 illustrates the wide discrepances which can exist between faecal eggs counts (geometric mean and median) and egg shedding range, and emphasises the caution required in the use of faecal eggs output as an index of parasite establishment as other authors indicated (Abbott et al., 1985). Despite the known limitations of the faecal egg counts, the differences in the percentage of infection between the two treatment groups, together with the differences in faecal egg counts (geometric means), might indicate that establishment was greater in the ewes from the unsupplemented group. The unbalanced nutrition and productive stress as factors enhancing the activity of strongylids have been also reported (Garcaí-Pérez et al., 1994).

On the other hand, it is generally admitted that supplementation can have large influence on forage consumption of grazing animals (Vallentine, 1990). Feeding small amounts of high protein supplement to cattle on low to medium quality roughages or being grazed on dormant-native grass range usually increases dry matter forage intake (Lusby et al., 1987). It could induce more favourable rumen conditions for fibre digestion as Caton et al. (1988) reported. Assuming preceding data the supplemented group ought to intake more strongylid infective larvae and show a greater nematode establishment.

Nonetheless, supplemented ewes generally showed smaller strongylid eggs output (geometric means) and percentage of infection. The faecal egg counts ranges (Table 1) indicated on an increased fecundity of acquired and established female worms in supplemented ewes.

The impact of strongylids on the sheep is also determined by the extend to which the immunological response limits invasion of gastrointestinal tract and affects the biotic potential of thrichostrongyle females (Sykes, 1987). The situation is however complicated by the evidence that the nutritional status of the host may also affect its ability to mount an immunological response to larval challenge (Yakoob et al., 1983; Holmes, 1987; Parkins et al., 1989; Symons, 1989). The importance of protein status for the development of immunological competence has been indicated, and that the use of dietary supplements can reduce the severity of infection with *Haemonchus contortus* (Abbott et al., 1985, 1986, 1988) and possibly with *Teladorsagia circumcincta* (Brunsdon, 1964).

The increase of strongylid eggs output during late pregnancy and 6 to 8 weeks immediately post-partum caused by transient lose of resistance to helminth parasites is well documented (Leyva et al., 1982; McKellar, 1993). The periparturient rise of strongylid eggs in ewe faeces is the most important source of infection for a lamb and, as results in Figure 3 show, supplementation reduced periparturient strongylid eggs output and could diminish the risk of strongylid infection in lambs. The reduction of anthelmintic treatments is claimed by the increase of drug resistance in parasite populations and adequate nutrition management could be a solid way to reduce the severity of nematode infections.

CONCLUSION

In conclusion, the results show a tendency that barley supplement in grazing Merino ewes reduces the eggs shedding of strongylids naturally acquired. However, the role of different basis outlined like nutritive status and immune response and the sheep breed especially (Stear et al., 1994) still requires further clarification.

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STRESZCZENIE

Wpływ dokarmiania na wydalanie jaj węgorków jelitowych z przewodu pokarmowego pasących się kotnych maciorek – merynosów.

Sześćdziesiąt maciorek merynosów, naturalnie zakażonych węgorkami jelitowymi, utrzymywano na pastwisku przez 140 dni ciąży. Połowa zwierząt otrzymywała dodatek 400 g jęczmienia na sztukę dziennie. U maciorek dokarmianych, oznaczana co 10 dni masa ciała była większa, a ocena punktowa ciała wyższa.

W inkubowanych próbach kału, pobieranego co 20 dni, określono przynależność systematyczną wydalanych węgorków. Maciorki nie otrzymujące dodatku ziarna wydalały z kałem więcej węgorków w pierwszym i w późnym (okołoporodowym) okresie ciąży; w ciągu całego doświadczenia stopień zakażenia był większy u maciorek tej grupy niż zwierząt dokarmianych. Jednakże u maciorek dokarmianych ilość jaj węgorków wydalanych od setnego dnia ciąży była większa. Autorzy wskazują na zwiększenie odporności pasożytów maciorek dokarmianych i dyskutują implikacje epidemiologiczne tego zjawiska.