

Observations on the effect of nematode worm burdens, and on the time of the day of grazing, on the liveweight gain performance of West African dwarf sheep

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SUMMARY

The nematode worm burdens and the liveweight gain performance of two groups of West African Dwarf sheep grazed at different times of the day were compared over a 6-month period. Group 1 was released at 5.00 am and Group 2 at 9.00 am. Both groups were rehoused daily at the same time (5 pm). Group 1 had a heavier worm burden with a mean of 2525 worms made up *Haemonchus contortus*, *Trichostrongylus* spp. and *Oesophagostomum* spp. compared with a mean of 2275 in Group 2. However, there was no significant differences in egg output between the two groups. Differential larval yields also bore no relationship to type of level of worm burden, a reliance on which may lead to misdiagnosis. The daily liveweight gain was 0.028 kg in Group 1 compared to 0.022 kg in Group 2, indicating that the liveweight gain in Group 1 outweighed the depressive effects of the worm burden acquired. It is suggested that early daily release, coupled with the strategic use of anthelmintics, may provide optimal conditions for growth of sheep.

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Introduction

The principle of rotational grazing in helminth control (Spedding, 1956; Oostendorp & Harmsten, 1968; Michel, 1969) is aimed at preventing infection of susceptible animals. It has been shown by several workers (Durie, 1961; Rose, 1961) that rainfall and moisture contribute to the availability of infective larvae on pasture.

RÉSUMÉ

ADJIEI, A. D.: *Observations sur l'effet de la charge de nématode et la période de la journée de forage sur la performance de gain du poids de moutons nains d'Afrique de l'Ouest.* La charge de nématode et la performance de gain du poids de deux groupes de moutons nains d'Afrique de l'Ouest qui foragent à des périodes différentes de la journée ont été comparées pendant une période de 6 mois. Le groupe 1 été laissé pour forager à 5.00 a.m. et le groupe 2 à 9.00 a.m. Les deux groupes ont été faire rentrer quotidiennement en même temps à 5.00 p.m. Le proupe 1 a eu une charge de nématode plus élevée, avec un moyen de 2525 vers consistant de *Haemonchus contortus*, *Trichostrongylus* spp. et *Oesophagostomum* spp. que le groupe 2 qui a eu moyen de 2275. Néanmoins, il n'y avait pas eu de différences significatives dans la production des oeufs entre les deux groupes. Les rendements différents de la larvae n'ont aucune rapport avec le type du groupe ou le niveau de charge de ver. Ceci peut mener à des faux diagnostics. Le gain du poids journalière était 0.028 kg dans le groupe 1 par rapport à 0.022 kg dans le groupe 2, ceci indiquant que le gain du poids dans le groupe 1 était plus grand que les effets dépressants de la charge de ver acquis. Il est évident que si des élevages foragent très très tôt le matin, et avec l'utilisation stratégique des anti-helminthes, on peut obtenir des conditions optimaux pour la croissance des moutons.

In the application this principle, release of animals for grazing at certain times of the day can be delayed, thereby avoiding the early part of the day, when prevailing ambient conditions are likely to be most favourable to the larvae. This practice, on the other hand, may deny the animals the most favourable time of the day for grazing as well as reducing the effective grazing time, since it has

been observed that animals show periods of grazing and resting while on pasture (Payne, Laing & Raikeva, 1951; Arnold & Duzinski, 1978).

It is also not known whether delaying the release of animals is likely to result in a significant reduction in host worm burdens. It was, therefore, decided to assess the effect of varying the time of release of sheep for grazing on their worm burdens and liveweight gain under natural grazing conditions in Ghana.

Materials and methods

The experiment was undertaken at the Animal Research Institute Experimental Farm, Pokuase, Ghana, from June to December 1988, during part of the major and minor seasons. The climatic conditions at the Farm have been described (Agyei, 1991).

Thirty-two west African Dwarf (WAD) rams, 8-15 months of age, were tagged and divided into two groups, ensuring that each group possessed a similar starting weight. Each animal was faeces-sampled weekly and the total egg counts measured by the modified McMaster technique (ADAS/MAFF, 1986). Faeces from animals in each group were pooled and cultured; the 3rd stage infective larvae (L3s) were counted and the first 200 differentiated into their genera as described by Agyei (1991).

Total worm counts were carried out at post-mortem on eight animals selected at random from each group. Recovery of worms was as described in ADAS/MAFF (1986). Each animal was weighed at the start of the trial and at 2-week intervals for the 30-week period of the experiment.

All the sheep were grazed in the same paddocks with a previous history of contamination; Group 1 was allowed to graze at 5.00 am and Group 2 at 9.00 am. Each group was grazed for 2 weeks to adapt to its time of feeding, before the commencement of the experiment. All the experimental sheep were returned to their pens at 5.00pm. The experimental sheep were dewormed at the beginning of the experiment using Fenbendazole (Panacur, Hoechst), at 8 mg kg⁻¹ body weight). All animals

were subjected to normal farm routine, such as tick control and feed supplementation.

Analysis of variance was carried out after square root transformation of worm egg count, on liveweight gains using the repeated measurement procedure in the statistical package, Minitab. Worm burdens were analysed by the non-parametric Mann-Whitney U test. Difference in egg count or liveweight gain at $P < 0.05$ was considered significant. The effect of week of experiment on mean fortnightly liveweight gain of each group was also tested.

Results

Egg counts were negative in all sheep 3 days after the administration of Panacur. The pattern of strongylid egg output in the groups was broadly similar (Fig. 1), with faecal egg counts rising soon after initial exposure in June. Values in Group 1 rose to 340 egg per gram (epg) and fell to 146 epg in September. In Group 2, counts appeared higher but fell slightly to 282 epg in September but rose to 371 epg in October. These differences were not statistically significant.

The species of L₃s revealed by faecal larval culture were *Haemonchus contortus*, *Trichostrongylus* spp. and *Oesophagostomum* spp., and their proportions are summarized in Fig. 1b, c. In both groups, *H. contortus* formed the largest proportion of worms encountered. There was a fall in the proportion of *H. contortus* in both groups between August and November, but showed a small rise in December.

The worm burdens at post-mortem are presented in Table 1., which shows that *H. contortus*, *Trichostrongylus* spp. and *Oesophagostomum* spp. were present. Although there were differences in the proportions of the species found in the two groups, they were not statistically significant. Group 1 had a heavier worm burden of 2525 while Group 2 had 2275 but the difference was not significant ($P = 0.05$). In all groups, *Trichostrongylus* spp. dominated; it formed 83 per cent of the group total worm burden in Group 1 and 79 per cent in Group 2.

Fig. 2 summarizes the mean monthly liveweight

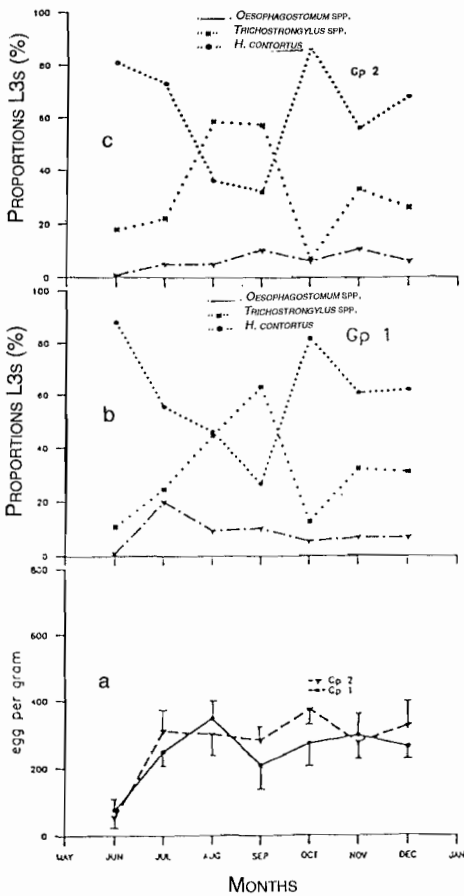


Fig. 1. (a) Pattern of egg output from both groups (b),c. proportions of L_3 s from faecal cultures of Group 1 and Group 2.

TABLE 1

Worm Burden of Sheep at the End of the Trial

No of rams	Mean \pm sem H. contortus	Mean \pm sem Trichostrongylus spp.	Mean \pm sem Oesophagostomum spp.
Group 1 8	375 \pm 109	2100 \pm 210	50 \pm 27
Range	(100-600)	(1400-2600)	(0-400)
Group 2 8	425 \pm 98	1825 \pm 409	25 \pm 16
Range	(100-1000)	(200-2600)	(0-200)

gain performance of both groups. Analysis of variance did not show a significant effect ($P=0.05$) between groups, although at the beginning of the trial there was an indication of a difference ($P<0.05$) in weight gain with Group 1 growing better than

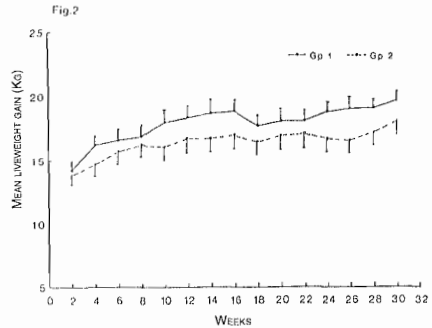


Fig. 2. Liveweight gain of both groups during period of experiment.

Group 2. The lack of significant weight differences between treatments, at the end of the trial was due to the considerable weight variation both between and within the groups, probably due to the age differences. The week of experiment effect on mean fortnightly liveweight gain of all groups was, however, statistically significant ($P<0.05$). This was due to the ability of Group 1 to compensate any previous weight loss quickly.

The mean total liveweight gain of animals in Group 1 at the end of the trial was 5.50 kg (with a mean daily liveweight gain (dlg) of 0.028 kg). Group 2 gained 4.25 kg (with a mean dlg of 0.022 kg).

Discussion

The results indicate that grazing in the early part of the day may cause a heavier worm burden, although late release does not significantly reduce worm burdens. Despite the heavier worm burden seen in the early-release group (Group 1), they demonstrated a better liveweight gain than the later release group.

It was observed that while *H. contortus* dominated the faecal larval cultures, adult worm count at post-mortem showed that adult *Trichostrongylus* spp. constituted the largest proportion of the

worms present. This can be explained by the fact that *H. contortus* is a prolific egg producer. Thus, estimations of worm burdens based solely on the proportions of species in larval cultures may lead to a misdiagnosis of the proportion of species present in the animal. This supports the view of Brunson (1968) and also confirms the observations of Berrie Bourne & Bremner (1988).

Chiejina & Fake (1989) also observed that though *Haemonchus* spp. formed nearly 76.6 per cent of the faecal larval population, *Cooperia* spp. which formed only 19.2 per cent of the faecal larval population were the more abundant on the herbage. Courtney, Parker, McClure & Herd (1983) have observed that in the face of repeated reinfection, *Trichostrongylus* spp. accumulate while there is rapid turn-over of *Haemonchus* spp. This would explain the higher count of *Trichostrongylus* spp. at the end of the trial, since it was done during the rainfall period when L_3 s were more likely to be available on pasture and the sheep, therefore, exposed to constant pasture larval challenge. The heavier worm burden in Group 1 indicates that the earlier time of release may be responsible since it has been shown that infective larvae are likely to be more available on pasture when moisture (dew) is high (Rose, 1961) early in the day. However, the worm burden of Group 2 suggests that the level of L_3 s on pasture later in the day is sufficient to establish an infection.

The daily rate of liveweight gain in both groups was low, showing the poor performance of the West African Dwarf sheep grazing under natural conditions. The decreased liveweight gains, seen between September and October, may be associated with increased helminth activity as evidenced by high egg output during this period. However, this loss in weight was quickly compensated for in the period following the fall in egg output in September. Holmes & Bremner (1971) have observed that loss in weight resulting from low food intake due to anorexia is a feature of helminth infection of sheep.

The relatively high daily liveweight gains, at the beginning of the trial, may have been due to the

administration of anthelmintic since this is known to have a positive effect (Thomas & Bell, 1988). Despite the high worm burdens in Group 1, they performed better than Group 2, indicating that they did not suffer from the effects of their worm burden as much as Group 2. This agrees with the observation that well-nourished animals can often withstand the deleterious affect of helminth parasites (Gordon, 1964; Brunson, 1968).

These results may suggest that the performance of Group 1 was due to their earlier release for grazing, which was in the coolest part of the day. O'Kelly (1988) has observed that heat stress often results in a reduction of feed intake. The ability of animals to regulate their feed intake (Ellis, Wylie & Matis, 1988) and their pattern of grazing (Payne, Laing & Raikova, 1951; Arnold & Duzinski, 1978) is well known and ensures that animals meet their nutritional requirements. In fact, it has been observed that sheep normally expecting a hot day will graze before sunrise and just before sunset (Dudzinski & Arnold, 1979).

It could be argued that the differences in the time available for grazing by the two groups is responsible for the different liveweight gains recorded. However, it has been observed that sheep can compensate for loss in grazing time by increasing the rate of biting and also the herbage dry matter intake per bite (Hodgson, 1982), and that increasing the grazing time available in the presence of good pasture is of limited value (Jamieson & Hodgson, 1979). It could, therefore, be concluded that the lower liveweight gain seen Group 2 is probably due to anorexia resulting from the combined effects of worm burden and heat stress which occurred at the time of grazing.

The daily liveweight gains seen in Group 1 (0.028 kg) are below those (0.070 kg day⁻¹) reported by Assiedu, Oppong & Opoku, (1974) with similar breed of sheep, under more favourable conditions of plantation pasture. Ngere (1973) also recorded a daily weight gain of 0.090 kg with the Nungua Blackhead sheep, a more productive breed, on the Accra Plains. Immediately following anthelmintic treatment, the sheep achieved such levels during

the first 2 weeks of the trial. This suggests the need for further medication later in the season.

The present investigation indicates that late release of sheep is not effective in significantly reducing worm infection. Moreover, it may deprive the animals of the most favourable time of grazing. It is suggested that early release of sheep for grazing, in the absence of continuous grazing, coupled with the strategic use of anthelmintics is most likely to provide conditions for optimal growth of sheep in this part of Ghana. It would ensure that animals graze at times most favourable to them.

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