

Relative economic benefits of strategic anthelmintic treatment and urea-molasses block supplementation of Boer goats raised under extensive grazing conditions at Onderstepoort, Pretoria, South Africa¹

A.F. Vatta¹, L.J.S. Harrison², R.C. Krecek^{3,4} and R.A. Pearson²

¹Onderstepoort Veterinary Institute, Private Bag X05, Onderstepoort, 0110, South Africa

²University of Edinburgh, Centre for Tropical Veterinary Medicine, Roslin, Midlothian, EH25 9RG, United Kingdom

³P.O. Box 12832, Onderstepoort, 0110, South Africa

⁴Department of Zoology and Entomology, Faculty of Natural and Agricultural Sciences, University of Pretoria, Pretoria, 0002, South Africa

Abstract

The potential economic benefits of combining strategic anthelmintic treatment for gastrointestinal nematodes and nutritional supplementation with urea-molasses blocks were examined in Boer goats, raised under extensive grazing conditions in the summer rainfall area of South Africa. Eight groups of nine goats were monitored over a 14-month period from August 2002 to October 2003. Nutritional supplementation with urea-molasses was carried out in the summer (wet season), from December 2002 to February 2003, and, or, the winter (dry season), from June 2003 to August 2003. All of the goats received symptomatic treatment for *Haemonchus contortus* infection when it was considered necessary as determined by clinical examination of the ocular mucous membranes for anaemia (according to the FAMACHA[®] system). Four of the groups received a strategic treatment for gastrointestinal nematodes in the middle of the summer (28th January 2003) while four did not. Under the climatic and extensive grazing conditions encountered during the trial, supplementation in the winter had the greatest economic benefit. Provided the nematode challenge is low and individual goats are treated when symptoms of nematode infection are noted, winter supplementation with urea-molasses blocks is recommended for extensively reared goats in the summer rainfall area.

Introduction

Disease caused by gastrointestinal parasites is considered to be amongst the top conditions that impact on the livelihoods of poor livestock keepers (Perry *et al.*, 2002). Anthelmintics are currently the most commonly used method of control for the parasites, but the emergence of anthelmintic resistance threatens the drugs' long-term efficacy. Protein supplementation has been identified as an alternative approach in the management of nematodes (Coop & Kyriazakis, 1999). The aim of the current study was

¹ This publication is an output from a research project funded by the United Kingdom Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID. R8151, Animal Health Research Programme.

to obtain quantitative data on the economic benefits of symptomatic and, or, strategic anthelmintic treatment and nutritional interventions against gastrointestinal nematode (*Haemonchus contortus*) infections in Boer goats. Information on the interaction of strategic drug and nutritional interventions, goat productivity and parasites is currently almost totally lacking but is required before rational decisions can be made on the application of such interventions in the field.

Materials and methods

Seventy-two male Boer goats were housed under worm-free conditions, fed a commercial pelleted feed and hay *ad libitum* and castrated if intact. The animals were intensively dewormed until faecal flotations (Reinecke, 1983) were found to be negative. Each animal was then artificially infected on 23rd August 2002 with approximately 3000 *H. contortus* larvae of a susceptible strain (Moredun strain) which had been stored in liquid nitrogen. The animals, 7-8 months old, were then moved to the Onderstepoort Veterinary Institute (OVI) experimental farm ('Kaalplaas'). The goats were grazed extensively in a field of approximately 150 ha. of mixed grazing and browse, which was judged to be of good quality. During an adaptation period of four weeks, the goats' ration of pelleted feed was reduced from 50 kg for the herd to 12.5 kg. The amount of pellets fed was further reduced to 10 kg on 14th October 2002 for ease of weighing and the latter amount was then fed for the remainder of the study. The pellets were fed to lure the animals back into the sheds at night and their effect on the animals' nutrition was considered negligible.

The design of the experiment proper is shown in Table 1. On 1st October 2002 the animals were randomly allocated based on live weight into eight groups of nine animals each. The goats were housed by feed group at night when urea-molasses supplementation was provided as appropriate. The goats were treated symptomatically with ivermectin (Ivomec liquid for sheep and goats, Merial South Africa, 400 µg/kg) if they were judged to be anaemic according to the FAMACHA[®] system (Vatta *et al.*, 2001). This method allows the animal's mucous membrane colour to be classed in one of five colour categories from 1 (non-anaemic) to 5 (severely anaemic). Salvage anthelmintic treatments were given to those animals scored in categories 3, 4 or 5. In addition they were either treated strategically with ivermectin on 28th January 2003 or not. On a weekly basis, the goats were weighed and sampled for faecal nematode egg counts (Reinecke, 1983). The study ran until 9th October 2003, whereafter the animals were slaughtered and their dressed-out carcass weights determined. Finally, the most economically viable option was determined by cost-benefit analysis.

Table 1 *Experimental design – Urea-molasses block supplementation and strategic drug intervention regimens for the eight groups of nine Boer goats*

Groups of 9 goats	Time of urea-molasses block supplementation	Symptomatic treatment with (+) or without (-) strategic treatment
1	Controls – no feed supplementation	-
2		+
3	Wet-season supplemented (December 2002 – February 2003)	-
4		+
5	Dry-season supplemented (June – August 2003)	-
6		+
7	Wet-and-dry season supplemented (December 2002 – February 2003 and June – August 2003)	-
8		+

Results

It was unusually dry from March to September 2003, with no rain at all from April to September (Figure 1), which may have been detrimental to the survival of *Haemonchus* larvae on the pasture. While the goats were infected (Figure 2), the egg counts were low throughout the study (<400 eggs per g of faeces). The strategic treatment was effective, with the mean egg count dropping to almost zero in the treated groups. After May, probably owing to the exceptionally dry winter conditions, all the groups had very low egg counts (<150 eggs per g of faeces). Regardless of type of supplementation, there were no statistically significant differences in the weight gain between the 36 strategically and symptomatically treated goats and the 36 goats given symptomatic treatment only (Figure 3).

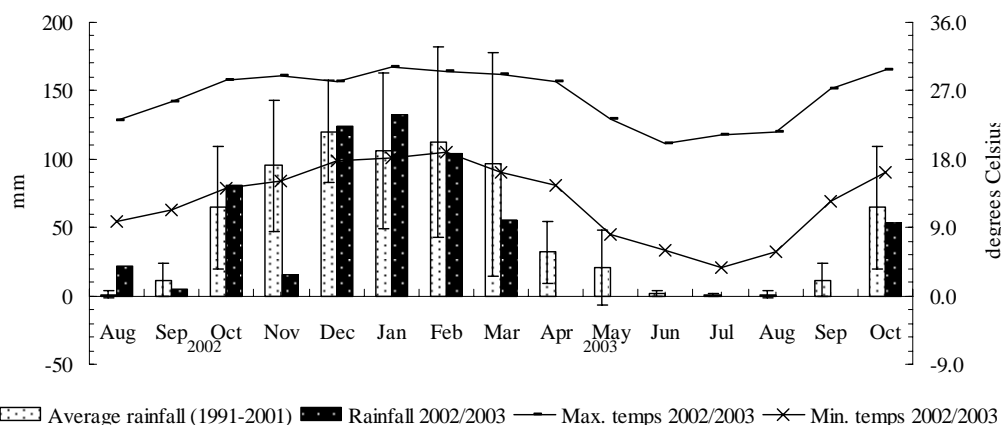


Figure 1 *The rainfall (compared with the average for 1991-2001) and temperature data for the Onderstepoort Veterinary Institute (OVI) experimental farm over the experimental period. (Rainfall data measured on OVI farm; temperature data for Pretoria as supplied by South African Weather Services.)*

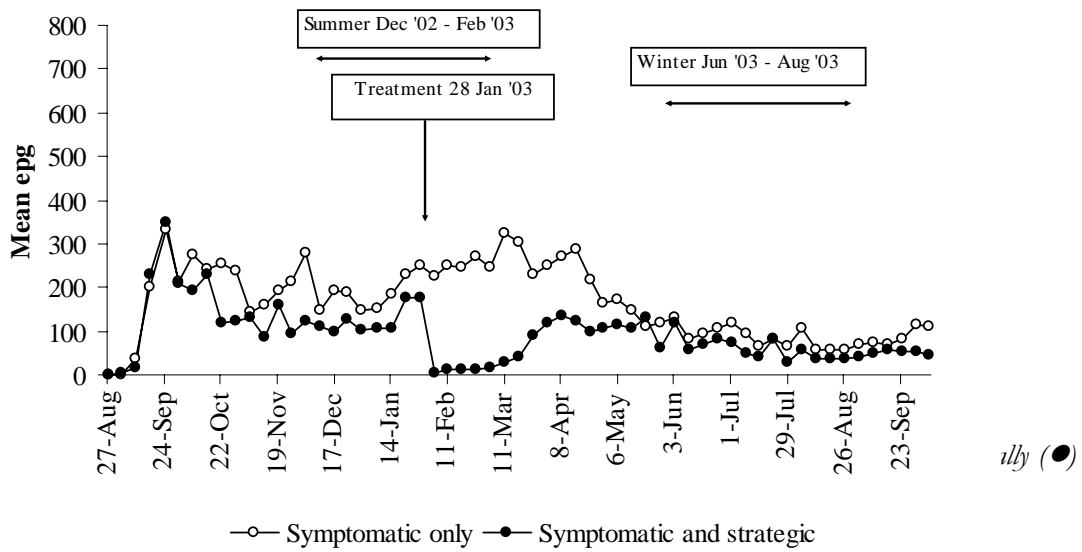


Figure 2 The mean faecal egg counts for the 36 Boer goats treated strategically and symptomatically (●) with the anthelmintic ivermectin compared to the 3 goats given symptomatic treatment only (○)

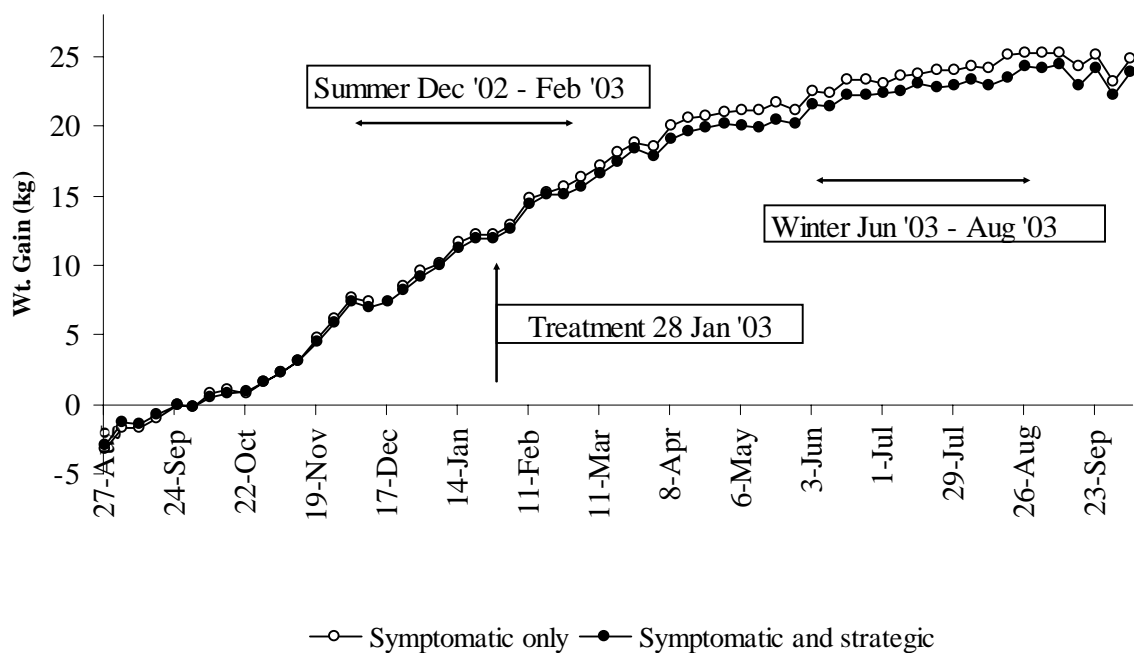


Figure 3 The mean weight gain for the 36 Boer goats treated strategically and symptomatically (●) with the anthelmintic ivermectin compared to the 35 goats given symptomatic treatment only (○)

The dry-season supplemented goats showed the greatest weight gain overall (Figure 4), while the wet-season supplementation appeared to have a detrimental effect on weight gain. The mean cold dressed-out carcass weight of the dry-season-supplemented group was greater than those of the other groups ($P=0.025$, 10 per cent level of significance, Figure 5). However, when the cost-benefit analysis was carried out, and the cost of

strategic drug treatment and urea-molasses block supplementation considered, only dry-season supplementation without strategic treatment proved economically viable (Group 5, Figure 6).

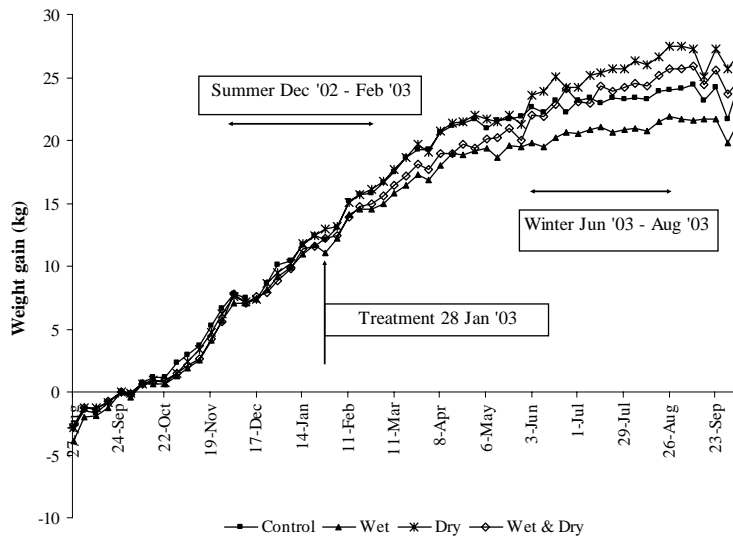


Figure 4 Weight gains for the four different feed groups of 18 Boer goats. One group received no urea-molasses block supplementation (Control, ■), one group received urea-molasses block supplementation in the summer (Wet, ▲), one group received urea-molasses block supplementation in the winter (Dry, *) and one group received urea-molasses block supplementation in the summer and winter (Wet & Dry, ◇)

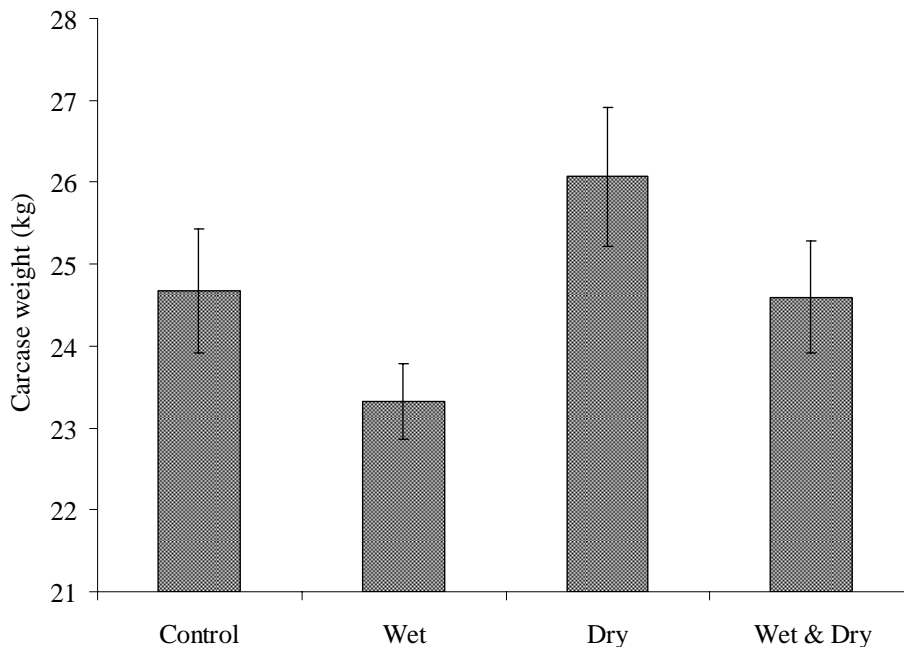


Figure 5 Cold dressed-out carcass weights for the four different feed groups of 18 Boer goats. One group received no urea-molasses block supplementation (Control), one group received urea-molasses block supplementation in the summer (Wet), one group received urea-molasses block supplementation in the winter (Dry) and one group received urea-molasses block supplementation in the summer and winter (Wet & Dry)

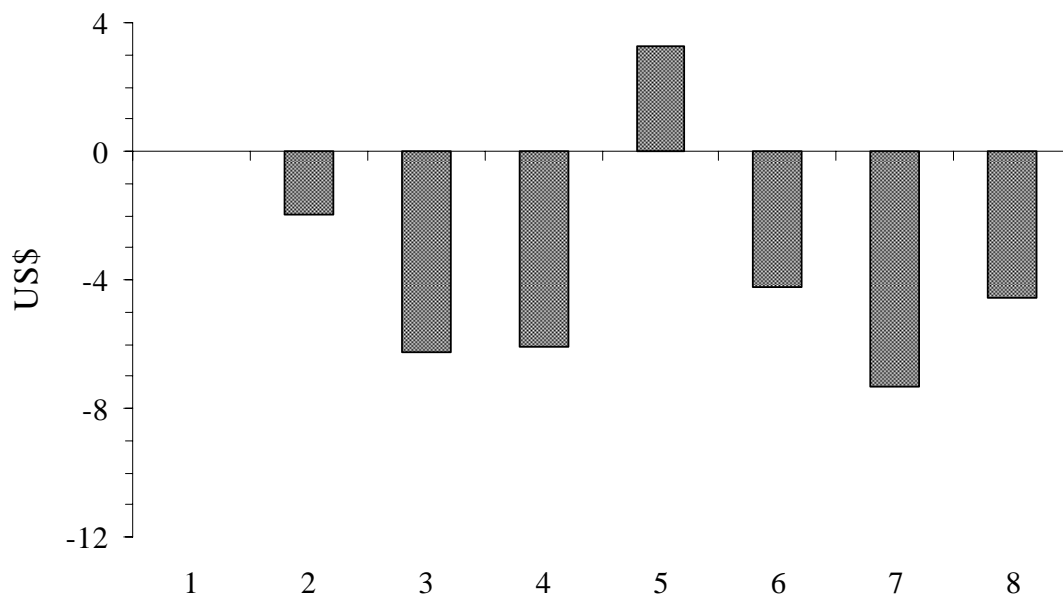


Figure 6 Cost-benefit analysis – a comparison of the market value per goat for each of the eight experimental groups of nine Boer goats, as detailed in Table 1, corrected for the cost of urea-molasses block supplementation and/or strategic anthelmintic treatment as appropriate and normalised on group 1 (control) values. Only the winter-supplemented group without strategic anthelmintic treatment (group 5) was associated with an increase in carcase value over the corresponding controls.

Discussion

The cost-benefit analysis indicated that dry-season, winter supplementation of Boer goats with urea-molasses blocks from June to August without strategic anthelmintic treatment, was associated with a six per cent increase in carcase value over the corresponding controls. This equated to US\$ 3.24 per animal which was considered economically viable and worthwhile. This strategy is, therefore, recommended for use in extensively reared goats in the summer rainfall area of South Africa, provided nematode challenge is low and individual goats are treated when symptoms of nematode infection (anaemia) are noted. A simple practical way of assessing whether or not an animal is anaemic is through the application of the FAMACHA[®] system.

Acknowledgements

R.L. Coop, Moredun Research Institute, Scotland, is thanked for his scientific input to the study and M.D. Chipana, R.F. Masubelle, L.M. Michael, M.W. Shima, M.O. Stenson and E.F. van Wijk, Onderstepoort Veterinary Institute, South Africa, are thanked for technical assistance. M.F. Smith and L. Morey, ARC Biometry Unit, South Africa, are gratefully acknowledged for statistical assistance. This paper is an output from Project R8151 funded by the Animal Health Programme of the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

References

- COOP, R.L. and KYRIAZAKIS, I. (1999). Nutrition-parasite interaction. *Veterinary Parasitology* **84**: 187-204.
- PERRY, B.D., RANDOLPH, T.F., McDERMOTT, J.J., SONES, K.R. and THORNTON, P.K. (2002). *Investing in animal health research to alleviate poverty*. ILRI (International Livestock Research Institute), Nairobi, Kenya, 148 pp.
- REINECKE, R.K. (1983). *Veterinary Helminthology*. Butterworths, Durban, South Africa. 392 pp.
- VATTA, A.F., LETTY, B.A., VAN DER LINDE, M.J., VAN WIJK, E.F., HANSEN, J.W. and KRECEK, R.C. (2001). Testing for clinical anaemia caused by *Haemonchus* spp. in goats farmed under resource-poor conditions in South Africa using an eye colour chart developed for sheep. *Veterinary Parasitology* **99**: 1-14.

Discussions/suggestions and comments on presentation:

Question: *How much does your deworming treatment cost?*

Answer: It depends on what type you use. When the trial was planned, we felt that Ivomec Tablets for Sheep and Goats (ivermectin, Merial) might be an appropriate remedy for the farmers in the target area to use because of ease of calculating the dose per animal ($\frac{1}{2}$ tablet for an animal weighing less than 25 kg; one tablet for an animal 25-50 kg in weight; one and a half tablets for an animal weighing 50-75 kg). These tablets had also been used in a resource-poor community where we had carried out previous work, in the same region as the present study. When we started to carry out the actual on-farm work, it became apparent that the ivermectin products were amongst the most expensive deworming remedies available to the farmers. For example, the cost of drenching a goat weighing 30 kg with one of the ivermectin products is approximately US\$ 0.24 per dose compared with \$US 0.17 per dose when treating the goat with one of the albendazole products. However, for comparison between on-farm and on-station work, we persisted in using an ivermectin product, but in an oral formulation for accuracy of determination of dose.

Question: *You have produced many pamphlets for distribution to farmers. How effectively have the farmers used the information?*

Answer: There is a great demand for information on diseases, as much information is still unknown to farmers. However, we have made some attempts at disseminating information.